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The Voltage Chaos

IT is a welcome change from discussions in the daily papers on the price of electricity for lighting to find consumers using the correspondence columns to voice exasperation at the multiplicity of declared pressures inflicted upon them. Those who have changed their abodes will sympathise with the annoyance expressed by the writers in finding their electrical appliances unsuitable for the new conditions.

But the nuisance is not confined to those who move from one town to another; every consumer desiring to add to his installation has to bear in mind such technical particulars as the voltage of his particular system, whether it is a.c. or d.c., and the frequency—any of which may vary from street to street. Should he desire to send electrical presents he has first of all to find out similar particulars from the prospective recipient.

Frequency will soon be standardised and some appliances will run off either a.c. or d.c. circuits, but there are few applications that are insensitive to voltage. The public cannot be expected to be keen on purchasing apparatus that may be useless in another house and, ignorant of the many factors that have contributed to the situation, loses faith in an industry that cannot, it supposes, settle so vital an elementary point.

Fewer than three-quarters of the 644 undertakings holding distribution powers, declare the standard pressure of 230 V, and of these well over a hundred supply on the d.c. system. Many of these "standard" undertakings give supplies at non-standard voltages also. Adding those that declare non-standard pressures only brings the number of different voltages to nearly thirty. Over thirty undertakings still retain 100-V systems which make adequate domestic electrification difficult.

About 270 undertakings supply at three or more voltages between 100 and 480, and in forty-three instances five or more voltage systems are employed. In some cases the variety may be due to transition to standard, but the voluntary progress cannot be regarded as satisfactory after the fourteen years that have elapsed since the passing of the 1919 Act, which contained provisions for compulsory unification.

The standardisation of distribution voltage is just as important as that of frequency and could be achieved at a fraction of the cost. The expenditure should be repaid within a few years by economies achieved in the manufacture of apparatus, by increased carrying capacity of mains (since the majority of non-standard voltages are less than 230), and—by no means the least important—the beneficial effect of simplification on the consumer's outlook, which would lead to increasing sales.

The work will have to be done at some time or other and will cost more the longer we hesitate, quite apart from the opportunity which the present conditions offer of carrying it out at a lower expenditure than will be possible later on.

Not enough has been made of the importance of voltage standardisation in recent discussions on the co-ordination of distribution, but any legislative proposals that do not place the subject right in the foreground will fall short of their purpose.

Electricity and Housing

PROPOSALS which have recently been prepared for the setting up of a National Housing Corporation or Board to produce 120,000 ten-shillings-a-week (inclusive) working-class houses throughout the country are being commended as deserving of careful examination by the electrical trade. We have no intention of discussing in the pages of an electrical journal the political aspects of the slum clearance and housing problem, whatever circumstances or whatever Governments may have prevented a successful policy being carried into effect thus far. It is noteworthy that vast sums are being expended weekly in unemployment pay to experienced building operatives, and everybody deplores the shortage of houses and flats of the class for which the scheme has been elaborated. But here, we are interested directly in the electrical possibilities of an enterprising handling

of the problem. The Corporation aims at financing and constructing the houses, and it is stated that £40,000,000 is ready to be lent for an immediate two years' building programme on a partial Government guarantee. The co-operation of the Treasury, the Ministry of Health, and other authorities is included in the plan, and it is held that the co-operation of the electrical trade would ensure that the houses, flats and tenements would be designed to use electric lighting, heating, cooking and power, thus reducing their individual construction cost by £40 or £50. The reader can work out for himself approximately what it would mean to the electrical industry if 120,000 small houses had to be wired, provided with fittings and appliances, and were to become consumers of electricity within two years. Experience in many parts of the country is demonstrating the readiness of the poorer classes to adopt electrical service even in existing and apparently undesirable premises, so that it is not a mere fancy that contemplates a similar tendency in the proposed properties.

Value and Price

IT is a good augury for the success of a new electrification scheme when reference is made at a public function, unconnected with the industry, to the expeditious manner in which the cables have been laid without causing inconvenience to the people, and many undertakings realise the importance of this initial good impression. After complimenting the contractors to the Westmorland and District Electricity Supply Co. (Messrs. Johnson & Phillips) on these grounds a leading citizen of Appleby said that if gas could not be supplied in a more attractive form, people would use electricity " whether they could afford it or no." The confusion of value and price with regard to electricity is an old one: that because electricity is so obviously superior to its rivals it is necessarily more expensive. Discussion of relative rates of charge is usually fruitless. That is why the successful and economical electrification of working-class flats is likely to be an important factor in teaching better-off people that the electrical way is usually cheaper as well as superior.

Unnecessary Subdivision

ALTHOUGH small high-speed Diesel-electric sets running at full load may have a thermal efficinecy as high as that of larger sets at varying loads, we think some proposals contained in the paper read by Mr. H. R. Ricardo before the Institution of Mechanical Engineers would go far to negative the merits of the heavy-oil engine in marine work. One of the chief attractions of this type of prime mover for ship propulsion is the saving in space (including that occupied by fuel) which its use makes possible. It is just in this direction of obtaining the maximum of power from the minimum of space that the most important of recent developments in design have been made. Subdivision would secure continuity of operation, but the reliability of the modern heavy-oil engine is such as to make this a form of over-insurance. The splitting up of the drive into fractional units calls for electrical gearing and control from a centralised position, but electric propulsion of ships has many other things in its favour and its advance would not be hastened by the adoption of small generating units.

Good Railway News

VERY welcome to the electrical industry, which has waited so long for the overdue advance in railway electrification, is the announcement of the decision of the Southern Railway Company to proceed with the electrical equipment of a further sixty route miles of line, in addition to the Sevenoaks extension recently taken in hand. The cost of the new scheme, under which the lines from Brighton and Wivelsfield to Eastbourne and Hastings will be converted, is estimated at £1,750,000, and the work is to be completed early in the year 1935, so that for the next fifteen to eighteen months this and the Sevenoaks operations will bring substantial added employment to electrical and other manufacturing and contracting interests. The scheme is bound to be popular, for it embraces such well-known resorts as Eastbourne, Hastings, St. Leonards, Newhaven, Seaford, and Lewes. The fact that the work is not in the nature of an experiment, but is definitely the consequence of success attained on the already electrified services to Brighton and Worthing, should carry weight with the hesitating authorities responsible for other lines running out from the metropolitan area to the country and coast resorts. The latest Parliamentary references to the long-projected electrification from Liverpool Street Station out to Ilford and beyond are to the effect that this is one of the schemes now under consideration by the Standing Joint Committee of the main-line railway companies and the London Transport Board. The nation is faced with the problem of rapidly increasing motor traffic on inadequate roads. The existing tracks of the railways used for carrying an efficient electric train service may well prove a partial solution of the problem. The outlook for the heavy side of electrical engineering is distinctly brighter in these days.

The Discharge-lamp Spectrum

IN our references to the several installations of discharge lamps of the high-pressure mercury-vapour type we have noted the progressive improvement in the spectrum. That the colour at present provided is not objectionable in many cases is shown by the results obtained at Ilford with " Mazda-Mercra " lamps (reported on a later page), which follows hard on the " Osira " success at Lewisham. In a few places where a greater proportion of red rays is considered desirable, correction has been made by the addition of tungsten lamps with a wattage of 300 for each 400-W discharge lamp. This method reduces the efficiency of the installation as a whole, but it is only a passing phase, as new developments are pending in the improvement of the spectrum as well as of luminous efficiency. Thus, the new " Sieray " lamp, to which Mr. J. N. Aldington refers in his article, now under test in the laboratory at the Siemens lamp works, Preston, requires the addition of only a 100-W gas-filled lamp to give a satisfactory colour rendering.

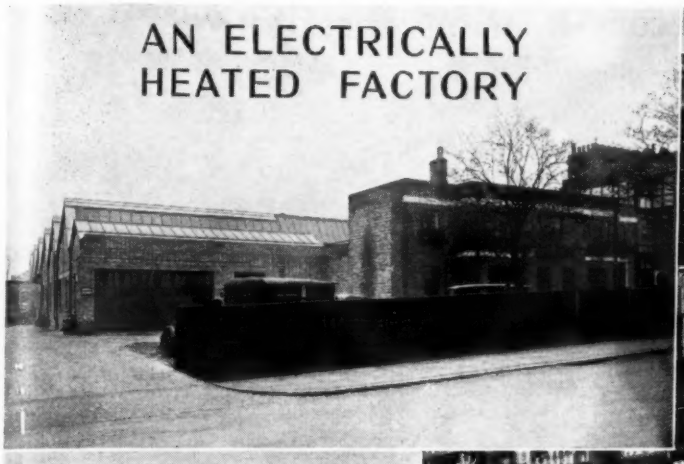
Losses in Rural Areas

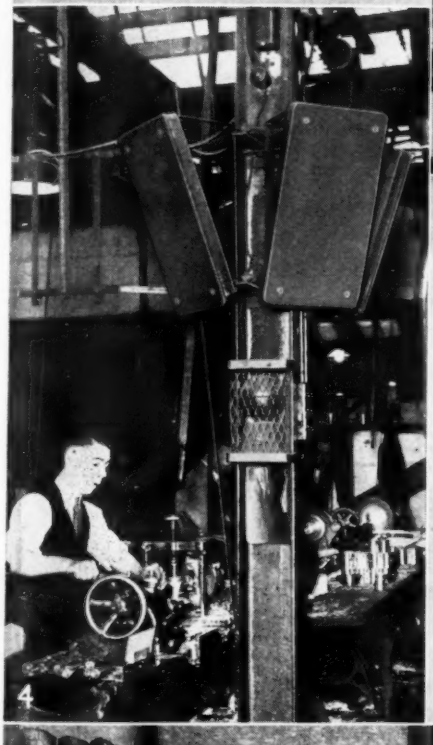
A CORRESPONDENT draws attention in this issue to the losses to date in the Bedford and Norwich rural schemes. Such losses are almost inevitable during the first few years after the opening up of any scheme of electrification, rural or otherwise. In the cases mentioned deficits were anticipated from the outset, as they were initiated specifically as demonstration schemes to ascertain the result of making a supply available to almost every inhabitant within two years; the terms upon which assistance was granted by the Development Commissioners and the Ministry of Labour indicate this clearly. The enterprises have involved the construction of many miles of h.v. lines upon which the return can for some time be only small, but the experience already gained has been valuable. The additional load obtained should in time be to the benefit of the ratepayers of the two towns, a benefit that will probably be all the greater because the schemes have been tackled on comprehensive lines. Municipalities having been entrusted with the public supply of electricity have to interpret their duties in the broadest possible manner.

Brush Diesels

THE Diesel engine is much to the fore nowadays, and the interest of electrical people will be stimulated further by the advent of the Brush Electrical Engineering Co., Ltd., into this field. The engine described on page 808 of this issue is not only a new departure for the Brush Company, but also an entirely new design with several noteworthy features.

AN ELECTRICALLY HEATED FACTORY





Some Views of the Installation at Specialloids' Works Described on the Next Page

1. External view of Specialloids' factory showing the general construction and north lights. 2. Flood heaters in the packing department. 3. Flood and tubular heaters in the inspection department. 4. Method of bracketing flood-heaters to a stanchion; radiation-stat in stanchion trough. 5. Wall-bracketed heaters and suspended radiation-stat (left) in the machine shop. 6. Local heater and thermostat in the laboratory. 7. Tubular heaters under benches in the pattern shop

A Notable Factory-heating Installation

Radiant flood warming with "comfort" control

OF the really very little headway that has been made in electric space heating generally, considering the vast field which lies open, factory installations can claim the least, or practically nothing. The possibilities are tremendous. We can hardly conceive an accurate estimate of losses for conditions which include doors almost always open and the practically constant flow, in and out, of traffic and materials. The impracticability of placing the sources of heat and the controls where they are required; the varying heating requirements in various parts of the same shop or room; and the need for flexibility as regards the layout of works equipment and machinery all add to the difficulties. But, as is shown later in this article, such flexibility of workshop equipment can be permitted with electric heating as would be impossible with hot-water and other systems.

Because of these considerations we attach much importance to the recently completed installation at the factory of Specialloids, Ltd., Barnet, producers of pistons for i.c. engines, which we were recently permitted to inspect by courtesy of the managing director, Mr. Bates, and under the guidance of Mr. J. G. Hunter, the company's purchasing agent, and Mr. E. Mac.A. Young, of Unity Heating, Ltd., who supplied the heating equipment and were responsible for the design of the installation.

Within the Estimates

For the major part of the works the manufacturers of the heating equipment estimated a consumption of 115,000 kWh per annum for only one working shift per day, and 148,000 kWh consumption for two working shifts. In actual practice the factory has been working two shifts ever since the heating apparatus has been installed, and for the past twelve months the energy consumption has been 142,649 kWh, or about 4 per cent. less than the estimate. The estimate given for the office heating was 30,000 kWh per annum, but the actual consumption during the year has been 31,032 kWh.

Depicting the "four-square and two-drop" layout of the flood heaters

Mr. Young stressed the great help of Messrs. Specialloids' engineers in supplying the fullest details of the factory and the general conditions which would affect any question relating to heating as an important contribution to the success of the installation which was planned with the greatest care.

The works consists of a major building about 160 ft. long and about 115 ft. wide, with 9 in. brick walls and a saw-tooth roof of corrugated asbestos and glass north lights supported on steel stanchions. At the north end of this building is a two-storey block of commodious offices, and detached from it are a pattern shop, laboratories, furnace rooms, and a foundry. The works proper may be considered broadly as divided into three sections—a large three-bay machine shop at the south end, measuring about 115 ft. by 72 ft.; the millwrights', inspection and production departments in the central portion, measuring about 50 ft. by 150 ft.; and stores, a packing shop and a garage at the north end measuring about 40 ft. by 115 ft.

How the Heaters are Arranged

For the basic heat throughout the workshops "Unity Flood" heaters are employed. These are similar in construction to "Morganite" heaters, which they supersede. For the machine shop the manufacturers' "four-square and two-drop" layout of heaters has been adopted. That is, to each stanchion are bracketed four heaters in square formation, and between each pair of stanchions are suspended two heaters back to back. Additional heaters are situated at convenient places on the walls. The heaters are all of the standard 1.25-kW size and are all fixed at about eight feet above floor level, and inclined at roughly 15 deg. from the vertical for downward projection.

The machine shop has a cubic content of 154,000 ft., and the installation for this portion is designed to afford a temperature of 58 deg. F. for average conditions. The total loading is 75 kW and the scheme is arranged in two sections, each with its own radiation-stat control. One radiation-stat in a newer part of the installation is suspended from the roof at about the same level as the heaters, and where it is not influenced by direct radiation from the heaters and walls or by draughts. Another radiation-stat is housed in the trough of one of the stanchions.

Of the central section the inspection department has a volume of 26,000 cu. ft. This sectional installation is designed to afford 58 deg. F., and the basic loading is 18.75 kW, the layout being similar to that of the machine shop. But because of the character of the work carried out in this section, that is, inspection for very fine limits of accuracy, additional local heat is provided by way of "Unity" tubes situated around the inspection benches. These tubes are not thermostatically controlled, and the result is that the temperature in this part of the factory is often maintained at as high as 65 deg. F.

The millwrights' department is adjacent to the inspection department and has a larger cubic content, *viz.*, 39,000 ft.; but because equivalent comfort can be maintained at a lower temperature than that of the inspection department the heating scheme has a lower loading, *viz.*, 16.25 kW. Maintenance of the lower temperature is brought about by the relatively lower loading in this section, the heaters being controlled by the inspection shop radiation-stat.

There is a pattern shop with a volume of about 12,000 cu. ft., and this is heated by tubular equipment fitted under the benches, with a total loading of 8 kW and subjected to ordinary thermostatic control as are also the packing shop and garage which each have a volume of 12,700 cu. ft. and a loading of 7.5 kW. Flood radiators are the source of heat in these two sections where the doors are almost always open to the outside air. In the adjacent stores, however, which has a volume of 86,000 cu. ft., both tubes and flood radiators are employed for local heating only, the total loading being 7 kW. The stores heaters are hand controlled. The offices and the laboratories are all equipped with tubular heaters, with local thermostatic control.

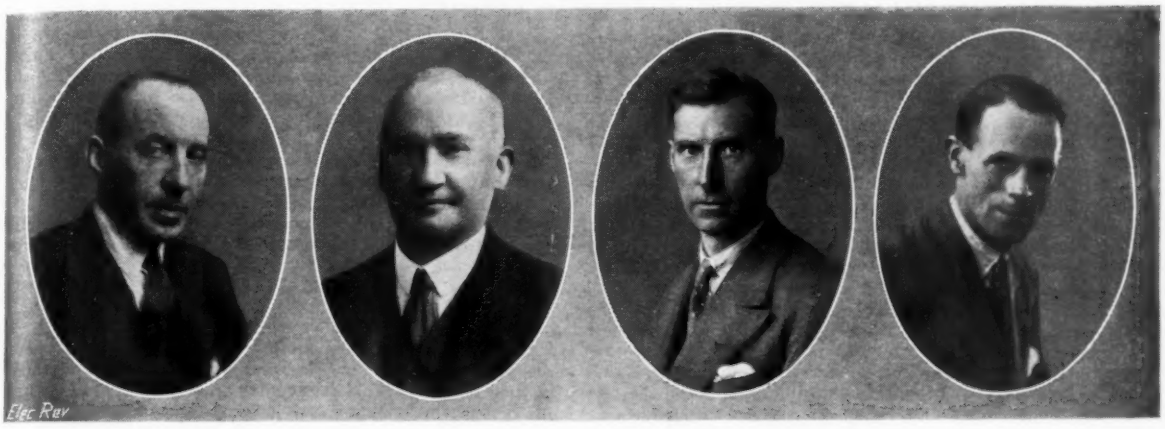
While it is not possible to isolate for heating purposes any particular corner or department in the main sections, it is possible to have either half of the machine shop installation in operation by itself and to isolate the inspection and other departments, including the offices, an arrangement which results in much convenience and economy, particularly in connection with overtime working.

Major control of the main heaters is by motor-operated switches governed by the radiation-stats. The total loading for the main factory is about 140 kW, and for the offices about 30 kW. Electricity is supplied by the Finchley undertaking at a heating flat rate of ¾d. per kWh, and the system is 250/500 V d.c., three-wire.

An Insulating Varnish Specification

The second of a series of British Standard Specifications for insulating varnish just issued deals with baking varnish of the bitumen type that gives a finished film which is flexible, moisture-resisting, and capable of withstanding vibration without chipping or cracking. It is suitable for the impregnation of coils, including those of electric traction plant, and for use in any situation where apparatus is subjected to vibration. Copies of the Specification (No. 514-1933) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

Some Driving Forces in the Industry: Thos. Broadbent & Sons, Ltd.



From left to right: Mr. H. Gordon Cran, director and commercial manager; Mr. Horace Broadbent, chairman and managing director; Mr. Brian L. Broadbent, general manager and director; and Mr. W. Hallitt, director and works manager

Electricity on the Farm. By A. E. Clifford

Opportunities for the manufacturer

WE hear a good deal these days of the advance in the use of electricity in farming throughout the country, and much has been written concerning certain well-developed areas. Mostly, however, the problem has been set forth from the supply point of view; only seldom has it been handled from that of the manufacturer. There are many uses for electricity on the farm, and in assessing the likely demand much depends on the line in which the manufacturer may specialise.

The farmer usually commences his new venture by taking electricity for lighting, then for such household applications as irons and vacuum cleaners. Thus, by observing the advantages of these small applications of power, he is led to consider the drive of his farm machinery. There are a large number of farms, however, which never get beyond electric lighting. In these cases, therefore, only the manufacturer of domestic electrical equipment, such as lighting fittings, and accessories, is concerned.

[*Jerome, Ltd.*

Mr. A. E. Clifford

On the farm which is in a position to use power, it is important to note that, land operations excluded, the largest motor required will be of 5 to 7½ h.p. Threshing machines take from 12 to 25 h.p., but as this is an operation most frequently done by contract, the demand from the individual farmer is small. However, it does present an opportunity for further investigations.

Recognising, therefore, that at present 7½ h.p. is the maximum size of power unit required, usually of the squirrel-cage type, the manufacturer can begin to sort out just what electrical machinery the farmer needs.

Types of Motors Required

The number of motors required per farm varies according to the type of farming carried out. For arable and stock farms of 100 to 300 acres, assuming threshing to be done by contract, there will be required: One 7½-h.p. motor for driving, grinding, and crushing machines; one 3-h.p. motor for driving smaller food preparing machinery, and one 1-h.p. motor for driving a pump. For arable and stock farms from 50 to 100 acres one 5-h.p. portable motor will do most jobs.

In this country approximately 450,000 farms come within the acreage mentioned. We can assume that there are 250,000 farms of 50 to 100 acres, and 200,000 farms of 100 acres upwards, but that many will not be in a position to take supplies for some years to come.

If 5 per cent. of the total is within easy reach of electricity supply, financially and technically, it follows that 12,500 farms of 50 to 100 acres, and 10,000 farms of 100 acres upwards may be in a position to require electricity and the necessary equipment. Therefore there should be a demand for 12,500 5-h.p. portable farm motors; 10,000 1-h.p. motors and control gear; 10,000 3-h.p. motors and control gear; 10,000 7½-h.p. motors and control gear. At present-day prices this represents the impressive total of £700,000 worth of motor and control business.

In estimating the annual demand it may be assumed that the above figure can be spread over ten years, and, assuming steady growth, the demand per annum would, therefore, be £70,000. On a fair share of such business the manufacturer could reasonably expect an annual turnover of from £8,000 to £10,000 on electro-farming.

This is very attractive business, and hence not a few manufacturing firms have of recent years tried to enter this market and aid in developing it. Unfortunately, however, the expected volume of business has not come!

Difficulties to be Overcome

There are several good reasons why it is not easy to obtain this business, chief among them being: (1) Agricultural depression, which has caused farmers to be unable to lay out any further capital. In this connection it should be realised that he may be called upon to pay for tapping an 11-kV line, which will cost something like £100 to £150. (2) Most large manufacturing firms are not in touch with a rural community. In the main, they are organised to meet the industrial demand which comes usually from concentrated areas, unlike farming which is over wide areas, often at some distance from any town. (3) Low discounts, which are in order for industrial negotiations often covering large amounts, are insufficient when dealing with implement agents and farming communities, where the individual demand is small. Often the agent has to stock, service, and give twelve months' credit, and he is not prepared to do this for small cover. Certain manufacturing firms have realised this, and offer generous terms, but the majority are content to consider that what is good enough for industry is good enough for farming.

One other opening to the farming market is to obtain the motor portion of such equipments as milking machines (at least 50 per cent. of these machines are now electrically driven), pumps, sprayers, saw-benches, hay elevators, bottle washing machines, milk separators, churns, incubators, refrigerators, &c.

At the present time this undoubtedly affords the best approach to the problem of equipping the farm electrically. But it does not cover the drive of barn machinery, and in this connection it is of considerable help if some alliance is made with a reputable manufacturer of agricultural machinery who is prepared to redesign his machines to suit the new drive. To some, it may seem that the only thing necessary is to incorporate means of speed reduction with the motor, and mount the unit on the machine frame somewhere. In the writer's opinion, however, the problem can only be successfully solved by the redesign of the farm machine as a power driven unit, complete in itself. This has already been done on the Continent, but, so far, no British manufacturer has adopted the idea.

The field is a vast one, and it may be that it requires completely new methods of sales organisation and attack.

Electricity Supply in Argentina

A THOROUGH survey of electricity supply in Argentina was recently presented by Mr. R. B. Whittick, Buenos Aires manager for Crompton Parkinson, Ltd., before the Argentine Centre of the Institution of Electrical Engineers. The paper contains more than fifty foolscap sheets illustrated with maps of the provinces of the Republic indicating the supply services available in each area. Voltages, types of current, tariffs, production and consumption figures and many other statistical, financial, and technical data are given in sixteen tables, which make this paper an invaluable source of reference alike for engineers resident in the Republic and British exporters of electrical goods.

The chief industries of Argentina are agricultural rather than manufacturing; while electrical development has not been great, it has kept pace with the demand. Many of the more important factories have their own power stations, and others generate steam by burning their own by-products. Some 75 per cent. of the population is concentrated in 25 per cent. of the total area of the Republic. In this area are the largest electrical undertakings and 642 of the 871 power stations.

The larger cities have ample supplies of electricity, generated in up-to-date stations and distributed partly underground and partly overhead. British interests were largely instrumental in commencing electrical development, but have gradually sold out until to-day there are no British-owned power stations. The total production in 1932 is estimated to have been 1,570 million kWh, of which 1,256 million kWh was produced by five groups of operators, 210 millions by sixteen companies, and six millions by Government power stations, apart from some 500 small plants of which no records are available, and excluding a number of railway and tramway stations. About 900 different rates and tariffs are in operation, and the production per paper peso of capital invested by the larger groups was 1.18 kW in 1932, while the fixed assets of the industry are stated to be £150 millions.

A view of the railway terminal district of Buenos Aires. In the background are the new power stations of the Cia. Italo-Argentina (left) and the Cia. Hispano-Americana de Electricidad (right). *(By courtesy of the Royal Mail Lines)*

It is a misconception to regard Argentina as a Diesel-engine country. Although steam turbine stations are few in number, more than 60 per cent. of the total energy is generated by them. The total steam capacity has increased from 450,000 kW in 1927 to 850,000 kW in 1933, the largest set being of 52,500-kW capacity. Alternator voltages have risen from 6,600 to 13,200 V, and of the twelve turbine stations generating for public supply, six are in the city of Buenos Aires, which is the most electrically developed area.

A Large Steam Station

The largest steam station (630,000 kW) contains three two-cylinder turbines, and a fourth is now being erected. Each drives two alternators on a single shaft, the main 54,350-kVA alternator generating at 13.2 kV, which is transformed up to 27.5 kV for transmission; the second alternator is for house service and generates at 2.3 kV. Two more boilers are being added to the existing eight, two of which are of the reheating type. Each boiler has its own independent coal-pulverising equipment.

A large number of Diesel-engined stations are in use in the interior of the country. Some 95 per cent. of the total power stations, or over 850 stations, use Diesel engines. It must be remembered that Argentina has few large cities, but numerous small towns and villages, while fuel oil is obtainable from the oil fields in many parts of the country. The largest Diesel station contains two 4,500-h.p. engines, but 10 per cent. only of the stations have more than 1,000 h.p. installed. About 40 per cent. are below 100 h.p., and the remainder have capacities of from 100 to 1,000 h.p. The smaller stations are invariably of the d.c. three-wire type and, due to lack of capital, they are often housed in primitive wooden huts, with the distribution lines slung from house to house for pole economy, while a partial service of some eight hours per day only is provided.

Some of the larger supply companies have linked up certain areas with high-voltage transmission lines, thus doing away with a number of small plants. The tendency to form high-voltage interconnected systems of about 10,000-h.p. capacity will increase, but the advantages of small self-contained turbo-generator sets of from 250 to 6,000 kW sets do not seem to have been appreciated.

Water Power Development

Hydro-electric development has not been extensive, due to the distances separating the water-power sites and the areas of consumption. Wide flat country separates the Andes, where the water power is, and the eastern seaboard. Three important cities depend on water power, but there are only five hydro-electric developments of any importance. The largest consists of three groups, each developing 4,300 h.p. under a head of 40 metres. The vertical turbo-generators develop 3,300 kVA, three-phase, 50 cycles, at 5,000 V, while the transmission lines, operating at 40 kV, are 40 km. long, and are carried on steel towers. The principal difficulty experienced is the rapid wear of the turbine blades due to the rock and grit carried down by flood water after the heavy rainfalls, which are a feature of Argentina.

Three potential water power sites are capable of yielding 415,000 kW, 362,000 kW, and 234,000 kW, respectively, but they are situated at distances of 1,000 km., 1,200 km., and 450 km. from Buenos Aires, which is the only area likely to be capable of absorbing an output of this order. As the falls are international in character, the above figures represent half utilisation only of the rivers, while the capital costs of the exceptionally extensive hydraulic works and long transmission lines which would be necessary would be very great.

Apart from short hydro-electric lines operating at from 11 to 44 kV, high-voltage transmission lines are not used extensively and only in one or two cases has 66 kV been used. The total length of h.v. lines hardly reaches 1,000 km., and their use has followed the advent of North American interests in 1927. Their construction follows American practice, steel-cored aluminium conductors being carried on pine poles imported from the United States. Lightning causes some trouble and spill-over gaps are used for protection, but there is little wind and snow to contend with.

Transmission and Distribution

In Buenos Aires transmission is by underground cables, 66-kV single-core and 33-kV three-core. Smaller towns and villages usually generate and distribute at 440 V, three-wire, but the tendency is for medium-sized towns to generate at 3,300 V with sub-stations connected on the ring-main system. The low voltages in general use are almost without exception 440 V, three-wire, d.c. in the country districts, and 220-380 V, three-phase, 50 cycles in towns. When the d.c. demand exceeds 1,000 kW a change-over to a.c. is made, the tendency being to standardise a.c. three-phase, 50 cycles, 380 V, four-wire, star-connected, 220 V to neutral.

The area of Argentina is 2,797,119 sq. km., and the population is 11,441,964. The consumption of electricity in Buenos Aires was 351 million kWh in 1923, which increased to 547 million kWh in 1928 and to 691 million kWh in 1932. The cities usually have water and electricity supplies. Outside is a market garden zone to which electricity is transmitted for electric pumping for domestic and irrigation purposes. The second outer zone is occupied by dairy farms and has neither water nor electricity. The third zone is the great wheat and cattle area, beyond which is a fourth zone of specialised production, such as wine, sugar cane, cotton, &c., and finally, the great open spaces which are at present out of touch with civilisation.

The differing characters of these zones or belts which surround the big cities should be kept in mind when estimating the potential demand for electrical service in Argentina. In the cities themselves a great variety of industries are engaged in the manufacture of small machinery, boots and shoes, clothes, and other small articles, but their production is still insufficient to meet the demand, although it is growing steadily.

Developments in Discharge Lamps. By J. N. Aldington, B.Sc., A.I.C.

The evolution of the hot-cathode type

UNTIL some two years ago gaseous discharge lamps could not be used for general illumination. They were in common use as "neon" signs, but the amount of light produced per foot was very small, and if the current exceeded a low value the cathode, or negative electrode, soon disintegrated and blackened the tube. Also, the high starting and operating voltages required did not permit of the lamps being run directly off the ordinary supply mains.

A "Sieray" lamp

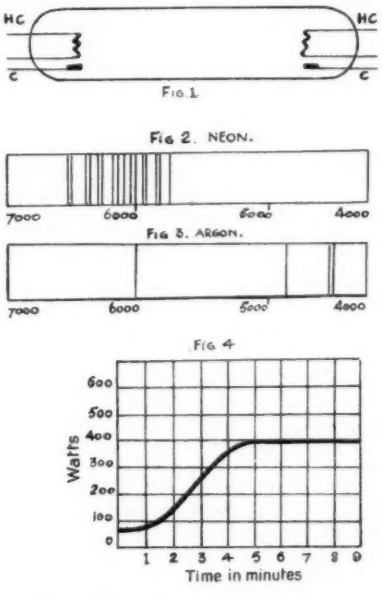


Fig. 1. Fig. 2. NEON. Fig. 3. ARGON. Fig. 4

Diagrams referred to in the text

The limitations of the cold electrode are indicated by reference to fig. 1, which shows diagrammatically a special discharge tube filled with neon at a pressure of a few mm., and fitted with two sheet nickel electrodes, C and C_1, and two special electrodes, HC and HC_1, the distance between the poles being 300 mm. The p.d. between C (positive) and C_1 (negative) must be increased to 600 before breakdown is indicated by the production of a column of red light. As the voltage is increased electrons move toward the positive electrode, while positively charged gaseous ions move toward the negative electrode. The velocity of these ions increases with the voltage, until a point is reached at which further ions are produced in the tube by collision between ions and uncharged gas molecules.

Visible light is produced from the tube when the velocity of the ions has become so high as to disturb the inner structure of the atoms and the orbital electrons are forced out from their normal paths. The return of these electrons in a series of jumps causes the visible radiation, the characteristic wavelength of which is determined by the value of the orbital jump. The large fall in potential in the gas layer immediately adjacent to the cathode is caused by the accumulation of positive ions at this point, which becomes intensely hot, even with a few milliamperes. The discovery of a means to prevent this accumulation of positive ions opened the door to the production of the modern high intensity gas discharge lamp, in which the negative electrode is coated with oxides of the alkaline earth or rare earth metals, such as have been used for some years for coating the filament in the dull emitter and for forming the cathode of the indirectly heated a.c. type of wireless valve. Pirani, of Berlin, and the G.E.C., of America, first suggested the use of such cathodes to enable heavy currents to be passed in the gas discharge and to reduce the cathode fall in potential to a few volts.

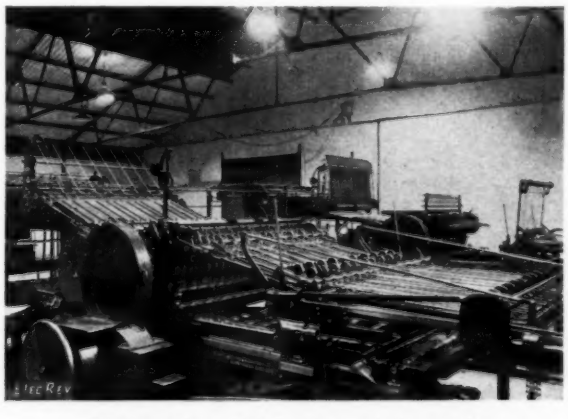
The special electrodes HC and HC_1 have been prepared so as to have this very low value of cathode fall. If the experiment is repeated with the electrodes HC and HC_1 at a red heat, the tube begins to emit light at about 250 V. This lowering of the initial striking voltage is due to the liberation of an electron as soon as each positive ion reaches the negative electrode, thereby neutralising the positive ion so that there is no accumulation of ions such as occurs in cold cathode tubes. Heavy currents can now be passed through the tube without damage to the electrodes, and the amount of light emitted is some forty or fifty times that possible when using the electrodes C, C_1, with a drop across the tube of only about 50 V.

Control of Colour

The colour of the light is controlled by the nature of the gas filling. All the elements emit characteristic spectra when suitably excited; for instance, a sodium salt placed in the flame of a Bunsen burner emits a yellow light of wavelength 5893°A, while strontium gives a red light, with a spectrum consisting of lines both in the red and blue end. In the Bunsen flame the heat excites the atoms and their electronic vibrations cause the different colours. In the gas discharge tube the spectra of different elements can be excited electrically, but in this case the substances must not combine with or impair the activity of the electrodes, nor must the gas or vapour disappear or clean up under the stress of the discharge. We are thus limited to a few gases such as neon, argon, and helium, but besides having the requisite electrical and other properties, the gaseous filling must emit light both useful in quality and in quantity. For instance, neon has a spectrum as shown in fig. 2, while the spectrum of argon is shown in fig. 3.

Preston war memorial with "Sieray" lighting

Compared with the continuous spectrum of white light, the light of argon is deficient in quality and in intensity, but neon has a large number of lines at the red end of the spectrum, and hence can be used as a source of red light. Very few of the other suitable gases have spectra offering possibilities for the efficient production of either coloured or white light, but the use of certain metallic vapours enables light to be produced at relatively high efficiencies. In the "Sieray" lamp, for instance, besides the rare gases, mercury vapour is employed in considerable quantity. The lamp proper is surrounded by an exhausted outer jacket to minimise heat losses and the inner tube containing the vapour can be maintained at a high temperature.



Discharge lamp lighting in a printing works

On switching on the mercury vapour does not at once become completely volatilised, and (1) a diffuse blue glow fills the inner tube; (2) after about three minutes the discharge appears as a column of bluish-white light some ¾ in. in diameter; (3) after a further five minutes the full light output is developed and the light appears to be almost white.

Fig. 4 shows the relation between lamp watts and time. Condition (1) obtains until some 200-W is being dissipated; above this value the narrowing of the light source occurs rapidly. During condition (3) the wattage remains steady at 400, the light output increasing rapidly to its running valne.

As the radiation is chiefly in the blue, green and yellow parts of the spectrum, the light from the "Sieray" lamp lends itself admirably to the production of yellow and blue light of high efficiencies. With a gasfilled lamp and a colour screen to cut off all light except blue, the initial efficiency of the lamp, some 14 L/W, would be cut down to some two or three lumens per watt; while in the case of yellow screens an efficiency of about 4 L/W could be obtained. With the "Sieray" lamp the initial efficiency of the light source is 40 L/W as against 14 or 15 L/W, and the amount of light cut off by the screen is much less because the radiation is already deficient at the red end.

Operating two standard "Sieray" lamps at 300 W in primrose and blue bulbs, the first gives 4,500 lumens, and the second 4,000 lumens. The red "Sieray" lamp has a neon filling and operates at 100 W.

Electrical Characteristics

If a discharge tube is switched into an electrical circuit containing no appreciable resistance then, by repeated collisions inside the tube, the number of gaseous ions will increase at a very rapid rate, so causing a continuous increase in the current through the tube. Within a fraction of a second this current will have reached a value sufficient to blow the fuse or to destroy the tube, so some current limiting device must be used.

With a well-designed choke and a 400-W "Sieray" lamp operating on 230-V a.c. mains, the choke losses are about 20 W, giving a total consumption of 420 W. If a series resistance is employed the drop in the resistance will be of the order of 70 V, the running voltage of the lamp being 150. As the current in the circuit is 2.5 A the resistance will dissipate some 175 W, bringing the total Watts up to 575 and reducing the overall efficiency by 30 per cent. The choke coil reduces the efficiency by only about 6 per cent.

When the current is first switched on, due to the low cathode fall and the high conductivity of the gaseous filling, the drop across the lamp is only about 20 V. As the vapour pressure inside the lamp increases the electrical resistance also increases and the volts begin to rise rapidly, attaining a maximum of about 160 V in some 7 or 8 minutes. At the same time the current through the circuit starts at about 5 A, and falls rapidly during the running up period to about 2.5 A. The phase displacement due to choke can be corrected by the insertion of a condenser across the mains. The lamps start directly from the mains without the use of high-frequency filament-heating transformers or any auxiliary apparatus.

An efficiency of some 40 L/W from the light source enables a much higher standard of illumination to be obtained with the same watt consumption, and the narrow pencil of intense light can be situated at the axis of a parabolic reflector for floodlighting, giving an even light distribution free from spots. When placed vertically the minimum illumination is immediately beneath the lamp, and a wide throw of illumination can be obtained symmetrically round the source, whereas with the gasfilled filament lamp the maximum illumination is produced underneath the source and falls off rapidly in each direction. For the best results special lanterns should always be employed with these new lamps; the relatively low intrinsic brilliance of the light source minimises glare.

An approximation to daylight can be achieved by installing a 400-W "Sieray" lamp and gasfilled lamps of 300 total watts in the same fitting, the latter supplying the deficiency of red. The overall efficiency of such an installation is about 28 lumens per watt.

Man has become so used to artificial light that the differences between its colour and that of daylight are often ignored. It is only when a new source deficient in red rays appears that the predominance of this hue in other artificial illuminants is apparent. A preponderance of red in the light of the gasfilled lamp renders it unsuitable for colour matching, but enables it to correct the colour of the light from the hot cathode lamp. Much depends on familiarity when the colour of an artificial light source is being considered. The difference in colour between the light of the first carbon lamps and the sources used until that time was very marked. But whereas in incandescent filament lamps there are fundamental limitations governing the preponderance of red, no such similar limitations obtain in the case of the deficiency in red in the new lamp.

Work on this problem is being carried out in the laboratories of all the leading British and Continental lamp manufacturers. The hot-cathode lamp of to-day will no doubt be superseded by lamps working at still higher efficiences than those so far described, and having light emission giving colour renderings nearer to those of nature. In the laboratories of Siemens Electric Lamp & Supplies, Ltd., a new hot-cathode lamp is emerging from the development stage. This new lamp has an increased light output, whilst rated at 400-W, and red is well represented in the spectrum of its emission. There is still a slight preponderance of yellow causing the human features to appear sallow, but the harsh blues and greens have been eliminated.

Preventing Ruts in Commutators. By J. F. Romer

WHEN metal brushes were used the wear of both brush and commutator was of an irregular character, but as the brushes were very flexible and the contact resistance low, a slight axial displacement of the armature made little difference to the efficiency of current collection. With carbon brushes, however, the wear is much more regular, so much so that the ruts made in commutators which have been running a long time look as if they had been turned in a lathe. If a slight axial movement occurs, the brushes are jammed against the sides of the holders and prevented from feeding properly; as the ruts become deeper it will be impossible to so adjust the holders that the brushes are supported near the surface of the commutator, which is essential to prevent tipping in the direction of motion and sparking.

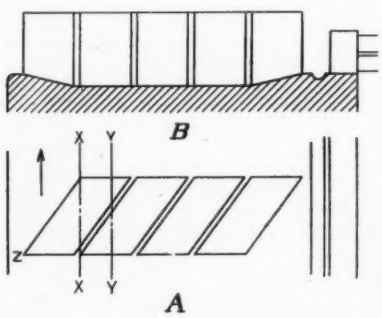


Fig. 1

The positive and negative brushes are sometimes staggered, but this does not entirely overcome the difficulty as the wear is not thereby made uniform along the length of the commutator, and a longitudinal movement of the armature will still tend to lift the brushes and cause bad contact. As a result the practice of oscillating the armature on machines like rotary converters has become general, but there are many cases in which this cannot be done.

The wear of a commutator or slip-ring is proportional to (1) the coefficient of friction (2) peripheral velocity, (3) pressure per unit area, and (4) time of contact. It is not possible to avoid ruts by altering (1), (2) or (3), but, by making the time per revolution during which a point on the surface of the commutator makes contact with the brush unvarying, the wear can be distributed uniformly over the length of the commutator. Fig. 1 shows one method of doing this: A is a plan of the brushes and the arrow indicates the direction of motion, while B is a cross section of the commutator and shows how it will wear. The brushes, instead of being rectangular, are rhombus shaped, the angles at the corners being so chosen that at any cross section, such as X X or Y Y in the direction of motion, the total circumferential width, and therefore the time of contact, is always the same.

The wear will therefore be uniform, except from X X to the corner; as the time of contact diminishes uniformly to nothing at Z, this part of the commutator will consequently wear conical. If an axial displacement of the armature occurs, the end brush will be lifted, but it will make very little alteration in the total area of contact. This method of avoiding ruts is therefore equivalent to rectangular brushes with oscillator gear, and has the additional advantage of allowing a shorter commutator to be used. It is, of course, essential that the spring pressures on all the brushes shall be equal.

Fig. 2 shows an alternative arrangement embodying the same principles, but the wear in this case is made uniform by staggering the positive and negative rows by a brush pitch. This method has the advantage over that shown in fig. 1 of avoiding any tendency of the brushes to twist in the holders, but it requires a longer commutator for a given area of contact.

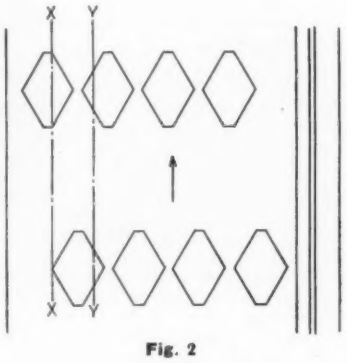


Fig. 2

Electricity on Portland

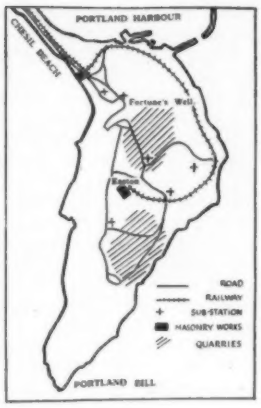
PORTLAND is an island joined to the mainland by the Chesil Beach, at Abbotsbury, near Weymouth. The island is about 4½ sq. miles in area and has a population of a little over twelve thousand, mainly concentrated in Fortune's Well and Easton, and a few villages, together with the naval base and the Borstal Institution. The stone industry—quarrying, masonry, transport, &c.—dominates the life of a large section of the inhabitants.

Excluding the naval base, which has its own generating station, electrification on Portland began seriously about eight years ago, when d.c. generating plant and motors were installed in the chief masonry works. A public supply of electricity was switched on for the first time on July 1st, 1930. Supply is taken from Weymouth at 11,000 V and distributed by the Portland U.D.C. at 400-230 V. The latest figures show: Consumers, 900; total connections, 2,306 kW; max. load, 204 kW; kWh sold (1932-33) 285,968; revenue, £5,024.

Before the recent addition of the Borstal Institution the domestic load formed about two-thirds of the total, and is now considerably more; but when the stone quarries are working full time again the relative proportions of domestic and industrial load will probably be evened up a little. The industrial load is made up mainly of quarrying crane motors, and consequently is unsteady, the ammeter on the crane motor circuit panel of the sub-stations usually showing rapid fluctuations between 50 and 400 A. The masonry works of the two chief stone firms have their own generating plant and so are not available to provide a steadying element.

Distribution is underground with the exception of three miles of overhead lines to the quarries. There are six sub-stations on the island, one of which is not at present in use. The five which are on load are (with one exception) equipped with Crompton h.v. and l.v. switchgear. The "B" sub-station which controls the Underhill district is situated within 150 yards of the Chesil Beach. It was originally housed in a kiosk, but the salt spray caused trouble, and a brick sub-station has now been substituted. The 11-kV circuit-breaker is of the "T.A.P." type. At Moorfield Road, the brick sub-station which controls the crane motor circuit and the town of Easton supply, two 312.5-kVA transformers are installed. There are six link disconnecting kiosks on the island. It is the practice to shut down the whole system every six months or so for a couple of hours, usually between 5 and 7 a.m. on a Sunday morning, for cleaning purposes.

A duplicate main to form a ring is being laid. It will be controlled by a four-panel, 11-kV Crompton truck-type switchboard to be installed on the strip of land which joins the island to the mainland.

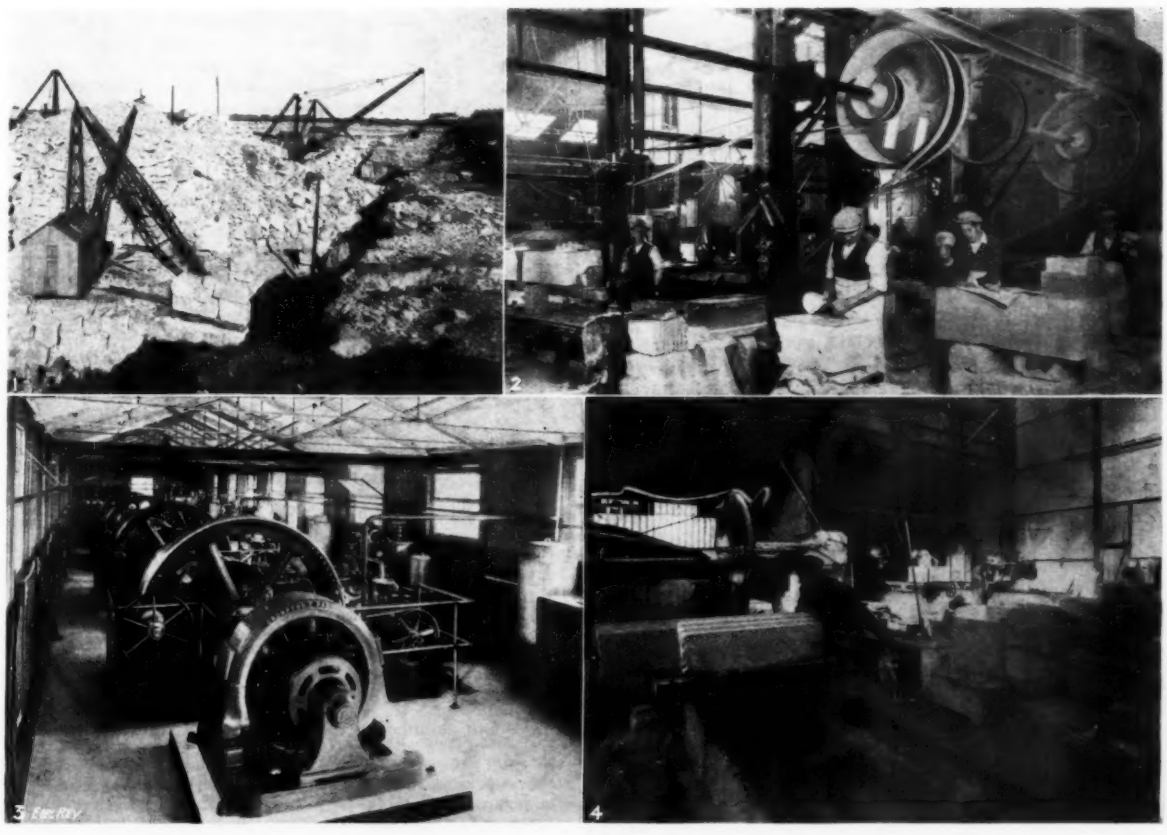


The domestic consumption during the last quarter was approximately 48 per cent. greater than during the corresponding quarter last year. At present there are nearly 900 domestic consumers out of 2,100 houses, and between them they have in use ninety-six cookers, 116 kettles, and nineteen wash boilers, all on hire from the undertaking. The charges are: lighting, 8d.; heating and small power, 3d. for the first 100 kWh, 2½d. next 400, and 2d. above that amount. A two-part tariff which is also available has a running charge of 1¼d. per kWh.

Electricity in the Quarries

The stone content of this "solid and single block of limestone" appears to be almost inexhaustible and a large part of the surface of the island is broken by quarries. This stone is, of course, a monopoly of the island, and has been in demand all over the world for hundreds of years on account of its weathering properties. The land on the island fetches as much as £1,000 an acre. The quarries are all open workings varying from 20 to 60 ft. in depth. The rough stone overburden is loosened by blasting, and building stone removed for despatch in blocks weighing normally up to 12 tons each.

When a public supply of electricity became available thirty-two of the numerous quarrying cranes were electrified, conversion in most cases being from steam. The work was carried out for the stone firms concerned by Messrs. Smiths of Keighley, who employed 35-h.p. Crompton-Parkinson "KRN" slip-ring motors in every case. These machines have 100 per cent. overload capacity in torque for 30 seconds. They are installed on the open side of the driver's cab, the totally enclosed type of frame affording protection against the fierce rains which sweep across the island. These motors, with a total h.p. of 1,120, together with a 35-h.p. compressor motor, form the



Some of the Plant on Portland

1. In the quarries, showing electric cranes at work. 2. The Bath and Portland Stone Firm's works. 3. The same company's power house. 4. Carborundum circular saws in a masonry works

main industrial load on the system. Electricity is supplied for crane motors at 1¾d. and 2¼d. per kWh.

Three miles of overhead lines supply energy to the quarrying cranes. Carried on wooden poles, with short spans, they run up and down the rocky and broken slopes, through the worked-out quarries and into the active ones in a remarkable fashion, and are a source of admiration tinged with surprise to visitors. The lines have, so to speak, to chase the motors which they supply, since the positions of the cranes are necessarily changed at short intervals. On this account, and because the lines are liable to be damaged on occasions by blasting operations, they need a considerable amount of attention.

Electrification has made the working of the quarries very much more efficient. (In an account published in the ELECTRICAL REVIEW of November 7th, 1930, of a somewhat similar quarry electrification in the North of England it was stated that whereas fuel for the steam cranes had cost 4s. per day per crane, the electrified cranes consumed only 1s. 2d. worth of electricity per day each. There were additional savings due to the absence of water costs and the reduction of labour charges.)

The present depression in the building industry has retarded the progress of electrification on Portland, but the users have in every case been so satisfied with the performance of the electrical equipment already in use that there is little doubt that the remaining cranes will be converted to electric drive as soon as trading conditions improve. The majority of the quarries on the island are owned and worked by the Bath and Portland Stone Firms, Ltd., and by F. J. Barnes, Ltd.

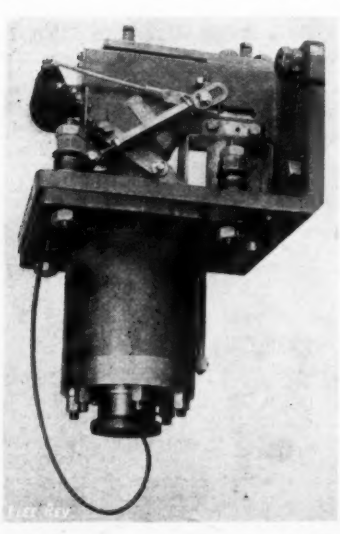
The chief masonry works on the island are those of the Bath and Portland Stone Firms, Ltd., Easton, where power is supplied from the firm's own generating plant comprising four Tangye oil engines, each driving a 48-kW 200-V Crompton d.c. generator. The station is equipped with Crompton switchgear. Electricity is produced at a cost of 0.805d. per kWh.

The drive to the stone-working machines is mainly through line shafting, some of the larger motors being separately housed away from the damp and stone-dust of the main shops. Others are enclosed in wooden casing; but in spite of these precautions the motors have to stand up to very severe conditions, since stone dust has remarkable powers of penetration and the jets of water playing on the cuts being made with carborundum produce a profusion of fine abrasive spray. Of the motors about twenty, ranging up to 60 h.p. and totalling approximately 200 h.p., are Crompton d.c. machines. Most of the remainder are second-hand machines of a variety of makes. The mechanical plant in the works consists chiefly of carborundum and diamond circular saws, swing-frame saws and planing machines. There are ten overhead electric travelling cranes in the yards.

At F. J. Barnes's Masonry Works at Portland Station, power is provided by a Robey oil engine driving a 35-kW Crompton d.c. generator which supplies current for six crane motors and two carborundum saws. The motors on the latter are of 14 h.p. each. The two Herbert Morris cranes of 12- and 5-tons capacity have hoisting, longitudinal traverse and cross traverse Crompton d.c. motors of respectively 24, 12 and 3 h.p., and 10, 10, and 1½ h.p. The generator is somewhat heavily loaded and a second 40-kW d.c. generator is being installed. The remaining plant, comprising a diamond saw and three swing frame saws, are driven through line shafting by the Robey engine.

Closing Mechanism for Circuit-breakers

EVEN when remote control is not necessary, the closing of circuit-breakers of large rupturing capacity by hand when heavy short-circuit currents are involved is not to be recommended. Some form of auxiliary mechanism is desirable, and for this purpose the "thermal gas closing mechanism" has been developed by Messrs. Ferguson, Pailin, Ltd.



General view of thermal gas closing mechanism with cover removed, showing trip coil, auxiliary switches and mechanical indicator

The device consists primarily of one of the company's type "C" free handle closing mechanisms in which the connection between the operating plunger and the circuit breaker mechanism is by means of a compressed chain operating through a chain race, of which one side is removed when the trip coils function so that the chain collapses and the breaker is free to open.

The solenoid is replaced by a steel expansion chamber, which is fixed to the trip-free mechanism by means of a shock-absorbing device in the form of strong compression springs surrounding the bolts which clamp the broad top flange of the explosion chamber to the underside of the base plate of the trip mechanism.

Inside the expansion chamber is a spring-loaded plunger connected by means of the chain coupling to the circuit-breaker mechanism. In the bottom plate of the expansion chamber a tapped hole is provided into which is screwed the receptacle for the closing element. The latter consists of a cone-shaped container made of thin metal in which is a small quantity of a material which gasifies at a temperature of approximately 300 deg. C.

A small heater strip passes from one side of the metal container to a lightly insulated pin which projects from the end of the cone. This pin passes through a steel plug, which is screwed into the base plate of the expansion chamber to form the receptacle for the closing element. Connection is made to the heater by means of a flexible lead attached to a wood plug, which is quickly secured in position in a bayonet cap underneath the steel plug at the base of the chamber. A spring-loaded contact on the plug makes contact with the insulated pin of the closing element.

The device is operated by passing a small current through the heater, the temperature of which is instantly raised to approximately 300 deg. C. The rapid gas expansion which ensues propels the closing plunger and, at the same time, compresses the springs holding the expansion chamber to the trip mechanism. The effect is to store up some of the initial energy due to the charge, so that a fairly uniform propelling force is applied to the plunger throughout the stroke, and also to safeguard the expansion chamber from the consequences of the very high initial pressure which would otherwise be developed.

A small vent at the base of the expansion chamber, terminating at the end of a small-bore tube with a fine-gauze cage, precludes any possibility of flame being emitted to the atmosphere. This vent also allows the descending plunger to eject the products of combustion. The spring on the plunger is merely to ensure resetting of the mechanism and to complete the exhaustion of the gases.

After each closing stroke the closing element has to be completely renewed. The elements are, however, inexpensive, and the renewal operations can be effected in less than two minutes. The heater may be energised by a small bell transformer, or dry battery, and the new mechanism is applicable whenever a uniform, rapid, and powerful stroke is required.

German Trolley-buses

THE electric trolley-bus service between Idar and Tiefstein (Nahe) has a number of interesting features. The route is about 2¾ miles in length, rising almost continuously from Idar. According to *Elektrotechnische Zeitschrift* the vehicles carry up to forty-nine passengers, but only twenty-four seats are provided. There are four driving and two steering road wheels, and no special chassis is employed, the bus body being a self-supporting steel structure. Two series-wound d.c. motors are mounted in a casing, which serves also as a frame for the rear axles and is attached to the body of the vehicle by T-shaped arms at each side. Each motor drives the two wheels on one side, thus securing electrical equalisation of drive and eliminating the need for a cardan-shaft. With a trolley voltage of 750-850 V each motor develops up to 40 kW at 1,500 r.p.m., and vehicle speeds of 25-28 m.p.h. are attained. Series-parallel control is employed as in tramcars. The vehicle can run about 15 ft. on either side of the trolley wires; the latter consist of two 80 sq. mm. (0.124 sq. in.) oval conductors carried by a flexible suspension, which protects them from vertical and horizontal oscillations and thus reduces to the minimum the risk of breakage.

MEETINGS AND DISCUSSIONS

Current Topics and Opinions Expressed at the Institutions

Current Transformer Leakage Phenomena

THE results of an investigation carried out at the National Physical Laboratory into the effects of leakage flux on the performance of ring-type current transformers with uniformly distributed secondary windings are described in a paper by Dr. A. H. M. Arnold, which is to be read before the Meter and Instrument Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 1st. If the primary ampere-turns are concentrated on one part of the core, large leakage fluxes are superposed on the working flux, and these cause premature saturation of parts of the core, with a resultant rapid rise in the ratio of primary to secondary current. A copper shield of special design was made for a 10,000/5 transformer, and when fitted it was found to reduce the leakage fluxes to one-fifth of the value existing before the shield was applied. Saturation of the core, which started at about two-fifths of full load without the shield imposition, did not begin until twice full load was reached when the shield was fitted. The ratio error of this transformer was 35 per cent. at full load without the shield in position, and was 1 part in 10,000 at full load with the shield in position. A shield of similar design fitted to a 20,000/5 transformer reduced the ratio error at full load from 67 per cent. to less than 1 part in 10,000.

[*Elliott & Fry*

Dr. A. H. M. Arnold

A method of testing current transformers by comparison with standard current transformers was described in another paper which Dr. Arnold presented at the same meeting.

The application of nickel-iron alloys to the construction of current transformers made it necessary to devise methods of testing with far greater accuracy than has sufficed hitherto, since the errors of the best modern current transformers are exceedingly small. A new method has been developed at the National Physical Laboratory which is extremely sensitive and very simple in both theory and operation. It obviates the use of resistance-standards for calibration as well as for routine comparisons.

The apparatus has three ranges, the most sensitive being capable of measuring ratio differences up to 5 parts in 10,000 with an accuracy of approximately 1 part in 1,000,000, and phase angles up to 2.5 minutes with an accuracy of approximately 0.1 minute. The other two ranges are respectively 10 and 100 times as great, and the sensitivity is correspondingly reduced. The design and construction of suitable standard current-transformers to cover ratios from 5/5 up to 12,000/5 are described, and the methods of calibrating these transformers to an accuracy of approximately two parts in 100,000 for ratio and 0.1 minute for phase angle are also outlined by the author.

Valve Amplifier Noise Investigations

SOME of the background noise in radio valve amplifiers is unavoidable, since it is caused by spontaneous "thermal agitation" voltages in the circuit, and by the inherent mechanism of thermionic conduction within the valve (the Schrott effect) and its "flicker" sub-component. The last-mentioned can apparently be much reduced by taking special precautions during valve manufacture, but the problem is intricate and unfamiliar to most engineers.

The phenomena are fully discussed in the paper, by Messrs. E. B. Moullin and H. D. Ellis, which was read before the Wireless Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 6th. Their investigations were carried out in the Engineering Laboratory of Oxford University, and they consider, first, the spontaneous excitation of any vibrating system by random impulses and, in particular, the excitation of an electric circuit by the chaotic movement of the free electrons within it.

With the hypothesis that the average value of the electrical energy in a circuit is equal to the average energy of a molecule, it is shown that the mean square value of the voltage across the condenser varies directly as the absolute temperature and inversely as the capacitance. Formulæ are then developed for the response of a thermionic amplifier, of any given characteristic, which is used to record the thermal-agitation voltage. These formulæ are put to searching experimental proof, and satisfactory values of Boltzmann's constant are deduced from the measurements. The effect of temperature is also investigated.

Formulæ are also developed for the voltage due to the Schrott effect: that is, the shock excitation of the anode-circuit impedance by the pattering of the electrons on the anode. Experimentally determined curves are given of the Schrott voltage, both with and without space-charge limitation. A formula is developed for the Schrott voltage under working conditions.

It appears from this that in radio-telephone receivers the Schrott voltage is likely to be more important than the voltage of thermal agitation, and that the signal/noise ratio can be improved by increasing the mutual conductance of valves, provided that the increase is not accompanied by an increased anode current.

Finally, the interaction of a radio-frequency carrier voltage with the voltages due to thermal agitation and to the Schrott effect is discussed.

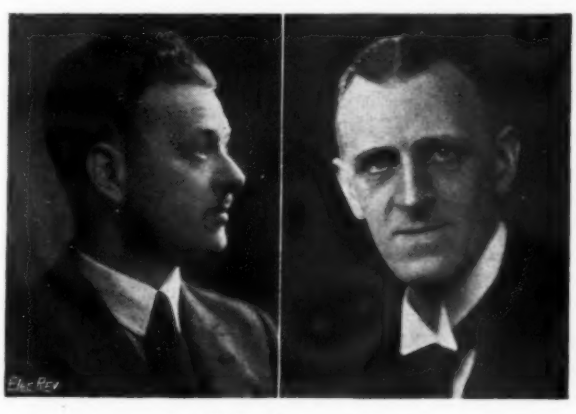
Automatic Voltage and Switch Control

IT is believed that the City of Manchester is the first area in this country to have completely automatic voltage regulation, and also supervisory control of its main sub-stations. Some particulars of the investigations made, equipment installed, and results obtained are given in the paper, by Messrs. W. Kidd and J. L. Carr, which was read before the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 7th.

The growth of the system is outlined briefly, and reasons are given why better control of voltage became necessary. It is claimed that, by a careful application of automatically controlled compensated voltage-regulators in main sub-stations, the voltage on distribution networks may be economically maintained within the permissible limits of ± 4 per cent. and that, generally, the voltage variation at individual services may be kept within 4 per cent. overall. At the same time, the fluctuations at the secondary terminals of high-voltage power consumers' transformers may be maintained within the limits for low-voltage distribution. Abnormal cases will, however, occur and will require special treatment.

The limitation of voltage variation to such a small amount possesses definite technical, economic, and psychological value; and available records over a short period suggest that it also results in increased sales of energy. The value of supervisory control is referred to, and one system is described in some detail.

In the case dealt with by the authors there are ten main sub-stations, with an aggregate plant rating of 200,000 kVA. They supply 293 distribution and consumers' sub-stations, with an aggregate rating of 227,350 kVA, and also converting plant totalling 183,400 kW. Six tap-changing transformers, eighteen boosters, and four double-induction voltage-regulators, all automatically controlled, have been installed in main sub-



[*Lafayette*

Messrs. J. L. Carr and W. Kidd, the joint authors of this paper

stations. In the majority of the existing distribution sub-stations there was not enough space available for separate regulators. The authors are of the opinion that concentrated loads exceeding 75 kW in amount in densely loaded areas should generally be supplied direct from high-voltage feeders.

If the public is to have good service and be satisfied with electric cooking, heating, etc., a good quality of electricity, *i.e.*, small voltage variation, is essential. This can only be supplied economically if auto-voltage control equipment is installed. Good results can be obtained with automatic gear at main centres, not at small sub-stations. In Manchester the cost was 2s. 6d. (excluding cable and builders' work) per kVA controlled, which will be paid for by the reduction of losses, increased revenue, etc.

The wages for attendance (one man and assistant) in a large sub-station amount to £1,100 per annum. If supervisory gear is installed the capital cost for thirty-three circuits is about £1,200. The interest, sinking fund, and maintenance charges are £113 and the annual cost of electrically operated, instead of manual, switches is £116. The total annual charges are therefore £229 instead of £1,100. The system thus pays for itself in three years.

Multiple Diesel-electric Ship Propulsion

SOME of the suggestions made in the sixth Thomas Lowe Gray lecture before the INSTITUTION OF MECHANICAL ENGINEERS in London on December 1st by Mr. H. R. Ricardo were, to say the least, unconventional. Mr. Lowe found it difficult

This " pylon " stands in the middle of a public road in Sidcup, Kent. It was there before the houses were erected but now the residents are reported to be objecting to it

to make out a case for a Diesel engine of any sort in really large or very fast vessels. On the scale of size the rising curve of the steam plant and the falling curve of the Diesel intersect at about the 6,000-h.p. mark, and the lecturer urged that plant up to this size should be composed of a very large number of very high-speed units.

There was security in numbers. Should an engine fail, a chalk mark on the door of its cell would suffice until port was reached, when the casualties could be removed bodily for reconditioning. The replacement of perhaps twenty units could be done in a few hours, and the ship need never be out of commission due to engine trouble.

One would not contemplate mechanically gearing a large number of units to a single shaft. Electrical transmission was more practicable. The type of engine proposed was the kind developed for heavy road vehicles, which had reached a high degree of mechanical perfection and become largely standardised, so that replacements were already inexpensive and quickly obtained.

Too Many Auxiliaries

Operated at, say, 1,600 r.p.m., each unit would develop 100 h.p. at a very comfortable load factor and with good economy. Such engines, however, were burdened with a great deal of auxiliary mechanism essential for road service. This added considerably to their cost and could well be dispensed with. There were, for example, a lighting dynamo, a fuel supply pump, a water circulating pump and lubricating oil pumps, none of which would be required; all this commissariat work could be catered for much more efficiently, and much more economically, by a centralised service. The cost of all this auxiliary gear, and still more the mechanism for driving it, formed a considerable item, and its elimination would reduce substantially the already low initial cost of each generating engine. The only auxiliaries which it was necessary to retain on each engine were the fuel injection pump, governor and, perhaps, the electric starting motor.

There were many manufacturers of commercial vehicle engines who would gladly accept £3 per horse-power for a bulk order for such engines. Each engine would be coupled to an electric generator, which would be bolted direct to the flywheel housing, thus forming a self-aligning unit.

Seventy-five Engines!

For a relatively large vessel requiring, say, 5,000 actual shaft horse-power for propulsion and, say, 1,000 h.p. for auxiliary and hotel services, the lecturer advocated installing a total of seventy-five high-speed Diesel-electric generating sets, each of about 100 h.p. when running at 1,600 r.p.m. Allowing for a 14 per cent. loss in the electric transmission (which was an outside figure)), a total of fifty-seven generating sets would be needed for propulsion, ten identically similar sets for auxiliary services, and, if the ship was going to be very long away from a home port, it might be advisable to carry perhaps eight more as spares, giving a total of seventy-five sets all identical and interchangeable. The overall dimensions of each set would be approximately 6 ft. 6 in. long, 2 ft. 6 in. wide, and 3 ft. 6 in. high; each would weigh slightly under 1¼ tons.

Since each generating set comprised a six-cylinder engine with extremely light moving parts and balanced both as to its primary and secondary disturbing forces, no foundation would be required. The engines would be placed in rows and in several tiers, one above the other, so placed that they could readily be slid and lifted out of the ship by a deck hoist. The entire power-generating plant, both propelling and auxiliary, together with eight reserve sets, would be represented in effect by about 110 tons of rectangular packing cases, each of 60 cu. ft. capacity, which might be stowed wherever convenient, having regard to accessibility, to unloading and to pipe work—clearly a very small bulk and weight as compared with the usual power-generating plant. The supply of cooling water, of lubricating oil, and of fuel oil would be served out to each set from a central distributing system, with pumps in duplicate, or even triplicate, in order to ensure absolute reliability. Each generating set would have its own electric starter operated from a push button on the bridge. Except for the speed governor, there would be no engine control whatever, and the ship's speed would be varied primarily by cutting in or out a number of the generating sets—never by varying the load on individual sets.

There were a dozen different ways of linking up the individual sets electrically. Whichever method were adopted, the complete independence of the generating sets should be maintained; each should be free to cut automatically into the circuit as soon as the engine had built up speed and voltage, and to cut out as soon as there was any reverse flow of current. Such switchgear as was required should be restricted almost entirely to the propelling motors.

Radiometric Condensers

AT the ROYAL SOCIETY OF ARTS on Wednesday evening Mr. G. G. Blake, M.I.E.E., F.Inst.P., read a paper on "Radiometric Condensers and Inductances." The first part of this dealt with the light-sensitiveness of copper oxide which was discovered by Holwacks in 1880. The author had found that the "Rayfoto" cell described before the Society last year was very responsive at first, but rapidly deteriorated. He had endeavoured to make a cell on the lines of the one advertised by the Weston Electric Instrument Co., and although he was unsuccessful in this, in the course of his experiments he had evolved a photo-voltaic copper-oxide cell of his own. Mr. Blake made one before his audience and demonstrated it.

The author went on to explain the construction and action of his "Type A" molecular radiometric condensers, which he described in the ELECTRICAL REVIEW of January 13th last. Several methods of capacity measurement had been tested in conjunction with the radiometric condenser, and he gave brief descriptions of the 1,000-kc. heterodyne method of radiometric measurement and the 250-metre zero-shunt (directly connected) method.

Slides were shown illustrating the characteristic curves of a molecular radiometric condenser, and the author went on to describe a later method based upon the action of an absorption wavemeter utilising circuits oscillating successively at 1,000, 10,000, and 60,000 kc. The range of sensitivity of the condenser was increased by means of a "screened-grid valve" balanced circuit. A means of producing sustained mechanical oscillations in the condenser was described, and

it was thought this might be applied to a burglar alarm.

The theory of the action of the condenser was dealt with, and a number of demonstrations were made to explain it. After a reference to other research work on the subject, other types of radiometric condensers ("B" and "C") were dealt with in some detail. There followed some remarks on bimetallic condensers which had been constructed, with a passing reference to the work of A. L. M. Dingee. The characteristics of bimetal were then touched upon, and the author proceeded to describe his experiments to ascertain if it were possible to zero-shunt and obtain radiometric control of a 60-cm. Barkhausen-Kurz oscillator.

Next Mr. Blake demonstrated two methods of measuring ultra-short wavelengths—the zero-shunt and audible methods—and followed this with notes on radiometric inductances and the use of a mercury thermometer as a radiometric resonator. The reading of the paper concluded with demonstrations of wave measurement and of the various types of radiometric inductances and condensers. An experiment was also made to show that if a resonator is employed as a pendulum and made to swing across the stationary waves parallel to the antennæ of an oscillator rhythmic changes are produced in the plate current of the oscillator as recorded in a zero-shunt galvanometer, and can be heard in a loud speaker.

Hot-cathode Lamps

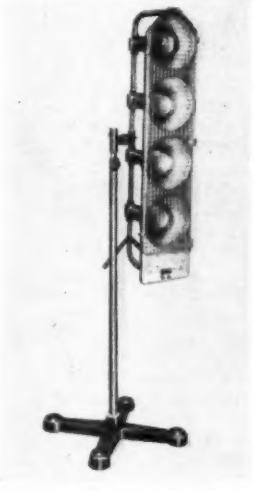
A DISCUSSION on this subject was opened by Mr. J. W. Ryde at the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS held on November 27th under the chairmanship of Mr. A. G. Hilling. Mr. Ryde exhibited a number of lantern slides, showing types of vapour-filled lamps and the coloured spectrum bands of the different elements and mixtures. He traced the development of the sodium vapour filled lamp and the high-pressure mercury vapour lamp from the cold mercury lamps of the early days, through the neon gas and similar floodlighting tubes of to-day. He showed how increased current was consequent upon the call for increased brightness, and stated that the new high pressure illuminants were not yet in use on the Continent, so far as was known, but that a twenty-mile stretch of sea wall on the Zuyder Zee was soon to be equipped with sodium vapour lamp illumination.

Most of the speakers who joined in the discussion asked for more information and explanations of relevant side issues. Mr. M. W. H. Wilson said it had been found that sensitivity to light was recorded in a very erratic manner, and it had been found desirable to calibrate the observers as well as the luminant. Mr. C. C. Paterson, O.B.E., said we should take a long view and visualise such a complete control of the hue of illuminants that present standards would not apply. The advantage might be found in diversity rather than in the possibility of obtaining a real daylight effect. The standard of street lighting of to-day would no doubt be discarded for conditions that would more than compensate the supply authorities for the reduced consumption of the new illuminants.

The Home and Industrial Cinema

THE Cine (Home and Industrial) Exhibition, said to be the first of its kind ever held, was opened at Dorland Hall, London, W., on November 27th, and it closes to-morrow (Saturday). Its object is to encourage the use and influence of films in the home, lecture-room and industry. The main exhibits are, of course, projectors and studio and other equipment for film production.

There is likely to be a rapid advance in this direction in the next year or so—something like that of the radio industry in the early days. Because the equipment is characteristically electrical, and because of the studio lighting apparatus required, as well as the sound-reproduction equipment, the business should be in the hands of the electrical industry.



The "35S" four-reflector photographic-lighting unit (Kandem Electrical, Ltd.)

The more directly electrical exhibits include converting and lighting apparatus. On the stand of the Electro Dynamic Construction Co., Ltd., we saw a wide range of machines for d.c. to a.c., a.c. to d.c., d.c. to d.c., and l.t. to h.t. conversion. Showroom convertors, each fitted with a rheostat and a voltmeter, are available in three sizes, the largest, 40-200 W, costing £22 15s. Similar dual-input convertors are available for both 100/125 V and 200/250 V d.c. operating voltages. Convertors for operation from fluctuating d.c. supplies are specially wound to work with an external regulator which has no moving parts and automatically keeps the output voltage within ±5 per cent., although the input voltage varies as much as 35 per cent.

An alternator designed for motor-car or other variable-speed drives can be mounted under the bonnet of a public address van and driven from the fan pulley. The output voltage remains constant with ±10 per cent. variation of engine speed. Excitation (6 to 12 V) is taken from the car batteries, and the normal speed is 1,000 r.p.m. (£28 for 400 W output). With commutators instead of slip-rings, rotary transformers of similar construction are available for operation on a wide range of d.c. voltages. A theatre convertor is constructed to afford immunity from interference, specially good voltage regulation, and frequency regulation within ±1 per cent. with the change-over where ¼-h.p. s.p. motors are employed.

The pattern "16" spot lantern exhibited by Messrs. A. O. Gibbons, Ltd., is designed particularly for installations incapable of carrying heavy loads. It takes a 60-W lamp with a 500-hour guarantee, and the concentrated light is claimed to approximate to that from an ordinary 500-W projector. The lantern dimensions are 7½ by 7½ by 9 in., and the housing is cool enough under running conditions to permit the use of gelatine screens for long periods safely and without fading.

A wide range of photographic lighting equipment shown by Kandem Electrical, Ltd., includes the recently introduced "35S" four-reflector unit. This embodies four standard 500-W "Nitraphot" reflectors housed together in line in a compact and handy manner. The lamps are protected by a wire guard which hinges on to the front plate, while the wiring is concealed in the tubular framework which holds the unit rigid. Legs permit the fitting proper to be placed vertically on the floor, and it can also be used horizontally as foot lights. Together with its telescopic floor stand it can be used in horizontal or vertical positions at any height from 4 ft. 6 in. to 8 ft. above the floor and inclined at any angle. Immediately below the lower reflector are two wiring terminals, an s.p. fuse, and a rotary switch which permits the use of two or four lamps at any one time.

Some of the amateur studio lighting is noteworthy. For instance, in No. 3 studio we saw excellent results from portable fittings supplied by Soho, Ltd. These are collapsible like an umbrella, having what appeared to be a special fabric reflector lining. A garden setting in No. 1 studio is well lighted by portable projectors supplied by Messrs. Sands, Hunter & Co., Ltd., and No. 2 studio, for a humorous setting, is equipped with Gibbons projectors. The "Permaec" electric

Public address van alternator for variable-speed driving (Electro Dynamic Construction Co., Ltd.)

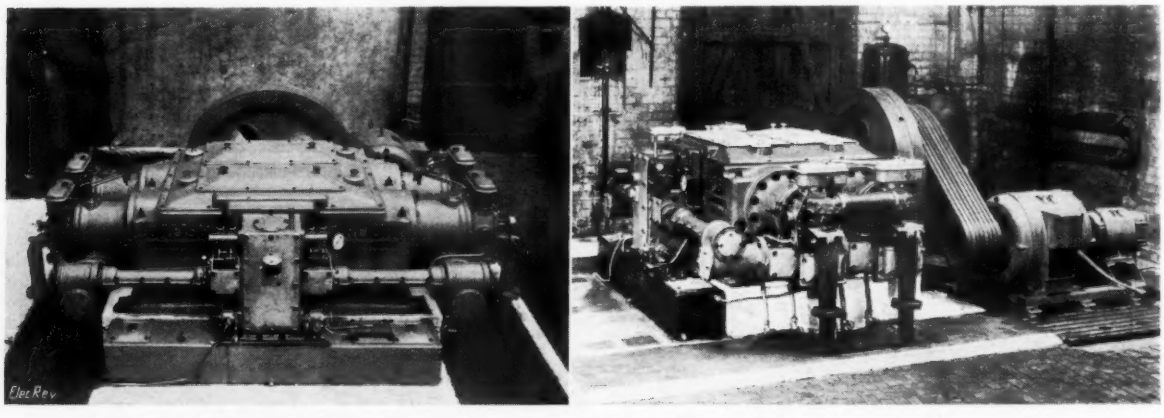
"Thermion" for baking records is an interesting exhibit. It will hold six records, afford a temperature of from 80 to 100 deg. C., is available for any standard voltage, and costs £3 12s.

Among a range of amplifier equipment seen on the stand of Partridge & Mee, Ltd., are a 12½-W unit (200/250 V) for a 16-mm. "talkie" supplying the photo-cell and the exciter lamp current, with choke-fed output and one main volume control; a 25-W amplifier for microphone or gramophone reproduction; and a 50-W four-stage equipment for a projector.

Horizontal Totally Enclosed Diesels

A new Brush departure

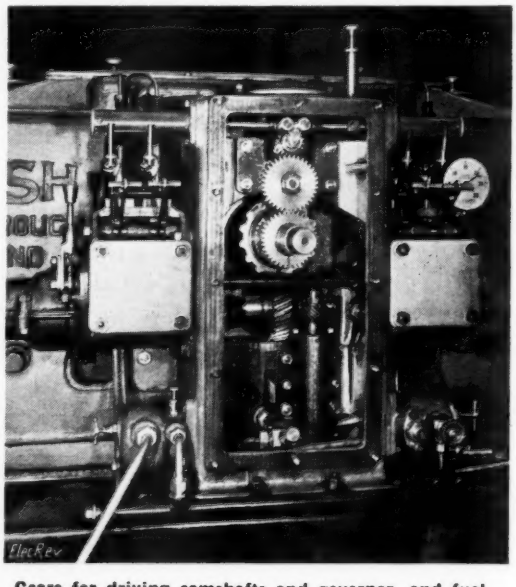
WE witnessed recently successful starting and running demonstrations of the first horizontal, opposed-piston, Diesel oil engine, produced by the Brush Electrical Engineering Co., Ltd. It is a four-cylinder 160-h.p. engine, and is being supplied complete with a "Texrope" driven alternator for running in parallel with a hydro-electric set.



Two views of the Brush four-cylinder, 160-h.p., opposed-piston, totally enclosed horizontal Diesel generating set

The engine is claimed to be the first horizontal totally enclosed one with forced lubrication throughout. Each cylinder is of 40 h.p. (standard), and on the unit basis engines to this design can be constructed in sizes up to 500 h.p. (400 to 600 r.p.m.).

The construction is such that all essential parts are easily accessible for examination and adjustment. Any of the pistons can be quickly withdrawn, and main bearings and big ends adjusted, after the removal of the top cover. Being horizontal the engine requires very little head room, and the crankshaft, pistons, &c., can easily be removed without special lifting tackle; all parts can be examined from ground level. All working parts are lubricated by a pressure system, except the outer bearing, which is ring oiled and can run for very long periods without replacing oil. The design ensures that the engine will operate effectively and economically at all loads with the widest range of commercial Diesel fuel oils. Excessive strains due to high firing pressures at starting and excessive loads are relieved by a large and effective safety valve, together with an injection retarder.



Gears for driving camshafts and governor, and fuel valves, at centre side of engine

Very large bearings result in low bearing pressures, and the crank case is completely enclosed by an oil-tight cover, which not only excludes dust but effects a considerable saving in lubricating oil.

The rigid bedplate is of deep section and it is reinforced by transverse ribs, and the frame on either side of the crankshaft is extended well above the centre line of the main bearings. Plenty of room is provided in the water space for the settling of mud, and a separate division in the crank sump prevents used cylinder lubricating oil from mixing with the main supply.

The cylinder liner is an entirely separate component, and is secured in position without the use of separate bolts or studs, and the forward end is free to expand or contract at will. The combustion chamber is perfectly symmetrical and has no dead air pockets, so minimising the formation of carbon deposits, and there are no ties between the hot combustion chamber walls and the cool jacket walls, thus preventing any risk of fracture owing to the heat expansion strains. The cooling water system for the breech end is entirely separate from that of the cylinder liner, and it is impossible for water to get into the cylinder past a leaking cylinder joint. The piston is fitted with special power and scraper rings, and is arranged with a floating pin in the connecting-rod bearing.

Lubrication oil is pumped from a large reservoir, separate from the engine, by a geared pump to a manifold in the engine bed, *via* a self-cleaning filter. The oil passes through the main bearings and the drilled crankshaft to the connecting rod large end bearing, and then through the hollow connecting rod to the small end bearing. A quantity of excess oil, always in circulation under pressure, affords cushioning and hence quieter running. Because of the precautions taken to prevent loss of oil, the forced-feed system of lubrication has proved to be most economical.

The exhaust valve is operated directly from the crankshaft, in an oil-tight casing and driven by skew gearing, through a rocking lever, and the inlet lever is operated through a hollow adjustable push rod and lever, all being totally enclosed. Automatically starting valves are arranged on the breech end, and the starting equipment consists of an air compressor connected by steel piping to an air receiver which, in turn, is connected to a special air starter on the engine.

Compressed air is admitted to the cylinder for the first impulse by operating the air starter valve by hand, after which this valve is automatically cam operated. The fuel pump and sprayer are designed to afford low consumption and clean running, and means are provided for advancing and retarding the time of injection while the engine is at work, to suit varying qualities of fuel, so preventing excessive pressure when starting up. The drive of the centrifugal governor is arranged to absorb any shocks and is fitted in an oil-tight casing, and a large fuel tank is provided with the necessary filter, &c.

Leclanché Cells

The first edition of the British Standard Specification for leclanché-type primary cells was published in 1930, and was immediately adopted by all the large purchasers of cells. The second edition, which has just appeared, differs from the first in two main respects. An alternative electrolyte to ammonium chloride is now provided, this being a mixture of zinc chloride and ammonium chloride in specified proportions. It is claimed that with this mixture the amount of crystallisation round the terminals of wet cells is appreciably reduced. The second main feature of the new edition is that the watt-hour outputs of the majority of the cells have been considerably increased, due to improvements in manufacturing technique

Copies of this Specification (No. 397-1933) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1. Price 2s. 2d., post free.

Correspondence

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession

An Intrusive Plant

In a recent issue I saw that someone had had his supply shut down by a bracken fern growing up in a kiosk; you comment on this as being most unusual.

It may interest your readers to know that last summer I had an exactly similar occurrence, but in this case the offending plant was a thistle. Our kiosk was situated on farm land which had been infested with thistles, and one found its way up through a cable entry hole in the foundation, and, encouraged by the gentle heat of the transformer and absence of light, made a growth of about 8 ft., but eventually outgrew its strength, and at 4 a.m. one morning collapsed across some horizontal links, with unfortunate results.

There was an amusing outcome. In a village some distance away, supplied from the kiosk in question, we drive a small flour mill, and, owing to the interruption in the supply at 4 a.m., the miller was brought out of bed to get things going again, as a sudden shut-down in flour mills takes some little time to put right. On the following morning he rang up to know what had happened, and I told him the tale of the thistle, which he received not only with credence but with interest.

All would have been well, but within twenty-four hours, in the middle of the following night, we had a little trouble in the engine-room which cut the supply off for two minutes, and the miller was again brought out of bed. On the morning after he rang me up in a rather heated frame of mind, and asked me why we had brought him out of bed a second time. He at once added, "Now, go on, tell me about a stick of rhubarb this time!" After that I was afraid to tell the thistle story to any other customer. H. WILSON,

Electrical Engineer, Ashford U.D.C.

Ashford, *November 30th.*

I read with interest and some amusement the letter of Mr. A. Nichols Moore in which he chides the engineer of Lowestoft for a lack of systematic inspection of kiosk sub-stations in allowing a fern to grow inside one of his kiosks. In the discussion on electric cooking at Bournemouth, surely it was Mr. Nichols Moore who told us of the tremendous number of cookers he had to remove because (to use his own expression) the oven was used as a pantry or cupboard and the top for the aspidistra.

I do not know which is the more amusing case, a fern six feet high growing in a kiosk or an aspidistra growing out of the top of a Newport cooker. If it actually pays consumers to hire a cooker and not use it this is scarcely indicative of a scientific tariff. A. J. ABRAHAM.

Bexleyheath, *December 2nd.*

Losses in Rural Demonstration Schemes

The correspondence column of your November 24th issue has a letter signed "Borough (and Rural) Electrical Engineer," which must be of interest to not only those engaged in the generation and distribution of electricity but to competitors such as manufacurers of small generating sets, gas undertakings and oil suppliers, as well as to every ratepayer.

The thirteenth annual report of the Electricity Commissioners shows the following figures:—

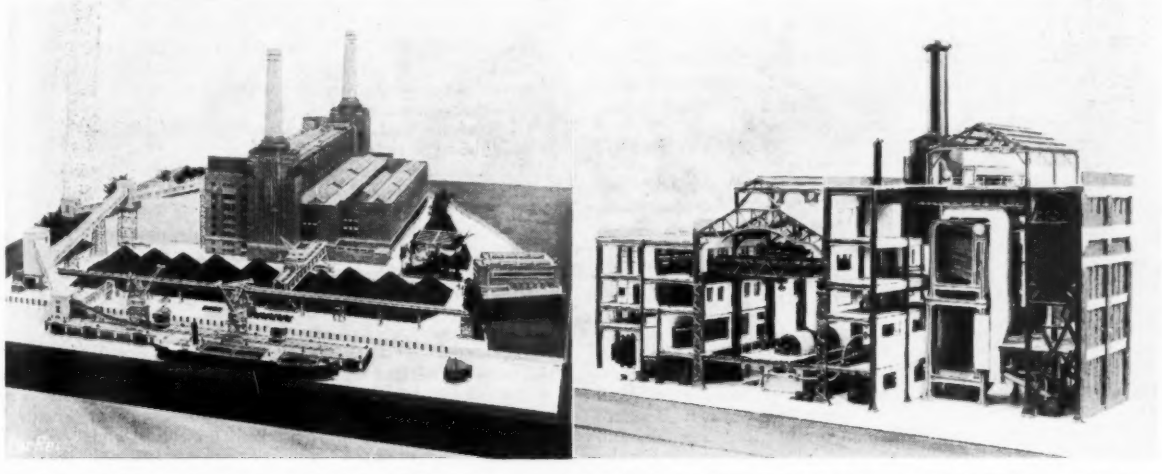
Bedford Demonstration Scheme.

	Year to March 31st, 1932.	Year to March 31st, 1933.
Net loss	£1,835	£2,097

Norwich Demonstration Scheme.

	Year to March 31st, 1932.	Year to March 31st, 1933.
Net loss	£1,293	£3,195

These losses are net losses after making provision for capital charges, and in the case of Norwich would have been increased by £434 in 1932, and £750 in 1933, but for the unemployment grants received by the Corporation in respect of the scheme; in other words, the Norwich ratepayers would appear to have had to provide for a loss on electricity supplied under the rural scheme to the extent of £1,293 in 1932, and £3,195 in 1933, whilst the Unemployment Grants Committee provided £434 for losses in 1932, and £750 for losses in 1933.



These ingenious models were produced entirely in cardboard by Mr. J. L. Samson, of Derby. The left-hand one will be recognised as the new Battersea station; the other represents a cross-section through the Hams Hall (Birmingham) station

It is beyond my comprehension to believe it can be just to make the ratepayers in Bedford and Norwich liable to pay for electricity supplied outside their boroughs, irrespective of whether such ratepayers take a supply themselves or whether they are gas undertakers, oil suppliers or generating plant manufacturers compelled to support an enterprise which may be doing them harm.

It should be borne in mind that in the case of local authorities supplying electricity in rural areas there are innumerable loopholes by which it can be made to appear that the rural area is providing a better return on the capital expended than the facts justify; for instance, there are such things as transport, labour on maintenance, general supervision, management, clerical work, collection of accounts, and other services which may not be properly allocated against the rural area, the charges in fact being in a great measure borne by the urban area. I do not know the facts in the two rural schemes mentioned in this letter, but it has been suggested that the allocation of costs in the cases of some local authorities operating in rural areas are too favourable to those areas.

I suggest it is unjust for any losses made, whether covered up or not, in one area to be borne by ratepayers in another area irrespective of whether they even require a supply of electricity or whether the enterprise on which the local authority embarks does them harm. In the case of a company any losses are borne by those who voluntarily invest money, and there is nothing to compel any ratepayer to be burdened with a loss. It might be held that a company's charges for electricity would be too high, but such charges would only be sufficient to cover actual costs with a reasonable return on capital, and any company with security of tenure endeavouring to charge high prices in urban areas to recoup losses in rural areas would soon find such an attitude foolish from every point of view.

That there must be proper control of distribution no one can doubt, but, given security of tenure with a sliding scale of prices and dividends, companies with large areas of supply are likely to do as well, if not better, than local authorities

without that unfairness which may arise in certain circumstances to ratepayers. COMPANY ENGINEER.

November 28th.

Overhead Road Crossings

The letter from Mr. Roberts in your issue of November 10th and the replies from Mr. Eden and Mr. Payn in your issue of November 17th, appear to have overlooked the fact that the Regulation No. 18 referred to is one of the Overhead Lines Regulations for securing the safety of the public, and to secure this safety No. 18 (1) and (2) (*a*) call for duplicate insulators supporting the conductors when at the side of or crossing roads, canals, etc.

If the duplicate insulators are placed side by side some bridle must be employed to make use of the second insulator, and this insulator is required so that in the event of a flash-over at one of the insulators and the line being burned through, the line will still be supported by the bridle and second insulator, thus preventing it from falling. If, however, the duplicate insulators are placed in tandem without a bridle, in the event of a flash-over at either insulator the line may be burned through and fall, so that no additional safety is given with the duplicate insulators.

I consider that the duplicate insulators in tandem with bridle above the line and projecting 6 in. beyond each insulator is neater looking, easier to erect, and gives better protection than side-by-side duplicate insulators.

Chesham, *November 28th.* R. J. JOCELYN SWAN.

I do not wish to trespass upon your valuable space by prolonging the correspondence in connection with the above, but I must take exception to the unpleasant remarks of "Road User," who is pleased to remain anonymous. I do not think that I particularly approved the use of tandem insulators without bridle wires, but I still contend that they are strictly in accordance with the Electricity Commissioners' Regulations.

I suggest that the youngest mains engineer appreciates the advantage of duplicate insulators with bridle wires, but, on the other hand, it should not be overlooked that many rural lines do not deal with particularly heavy currents, and in cases when fault currrent is not likely to reach a high figure there is little danger of the conductor burning through, and in such circumstances tandem insulators will probably be quite safe.

I do not know if "Road User" has seen the bridle fixed above the conductor on certain arrangements of tandem insulators. I refer to a bridle that is not tied to the other insulator in any way and is often secured by just one Crosby clip on each side. In such cases if the main conductor burnt through I am afraid the chances of the bridle holding up the line would be very remote in many cases, and if, although not distinctly

A motor transport vehicle, capable of carrying a load of five tons, which the Revo Electric Co., Ltd., has recently added to its fleet

stated, the Commissioners prefer a bridle wire, it should, of course, be tied in firmly to the main conductor at least two feet clear of the insulator at each side, and to the duplicate insulator. H. PAYN,

Engineer and Manager, Boston and District Electric

Boston, *Dec. 2nd.* Supply Co., Ltd.

Where Good Meter Readers Go

With reference to the correspondence in your journal on this subject, I think that any attempt to compare the output of meter readers in this country, and overseas, either in the United States or in Canada, is not worth the space taken in print.

I spent several years in New York City and prepared specifications, etc., for the change-over of consumers' factories and plants. I had ample opportunity to find out the very different conditions facing distribution departments there as compared with this country. GEORGE J. BUCKLEY.

Southall, *November 29th.*

Current Transformers

In reply to Mr. Ellis's query I would say that for the fault conditions previously supposed, but assuming the transformer to be of the shell type or to consist of a bank of single-phase units, the current in the faulty phase is negligible. On the other hand, for a core-type transformer a considerable current composed of equal in-phase positive, negative and zero sequence components may flow in the faulty phase, the currents in each of the other two phases being nil, since the zero sequence component is equal in magnitude and 180 deg. out of phase with the resultant of the positive and negative sequence components in these phases.

My object in drawing the analogy between the behaviour of a core-type transformer and the effect of a high impedance delta tertiary was to indicate the reason why a zero sequence component can exist in the secondary without there being a corresponding component in the primary. As Mr. Paul Mathews points out in his interesting communication, this analogy *is* admissible, the zero sequence component being a true magnetising current.

I am aware that Messrs. Dannatt and Dalgleish have not distinguished between the two types of transformer, and in this respect the statement in page 290 of their book requires modification. I would add that Messrs. Wagner and Evans in their original work which appeared in serial form in the *Electric Journal* also omitted to make this distinction but have done so in their recently published book.

G. A. ROBERTSON.

Fallowfield, Manchester, *December 2nd.*

Unfortunately, Mr. Mathews's contribution does not clear up the matter, for, whereas the case with which he has dealt concerns a star/star transformer with earthed primary neutral and fault on one primary line, the actual case under discussion refers to a transformer with free primary neutral, earthed secondary neutral and fault on one secondary line—a different proposition. THOMAS ELLIS.

Finchley, N.3, *December 2nd.*

A Home-wiring Specification

In your issue of December 1st Mr. Winton Thorpe indulges in a little playful sarcasm over the E.D.A. Electric Home-wiring Specification, stating that engineers find it necessary to visit premises before drawing up a specification, just as a doctor finds it advisable to visit a patient before prescribing for him. May I point out, in return, that the necessity for adaptation to particular cases does not prevent engineers from defining—and writing about—the principles upon which premises should be wired, or doctors from expounding the general laws of health.

All that the Association has done in its specification is to provide householders with a guide to the provision necessary in the way of points and wall-plugs in the hall, dining-room, bedrooms, kitchen, bathroom and other parts of the ordinary and medium-size house for the enjoyment of full electrical service. The specification, which incidentally calls for British-made materials of the highest quality, forms the basis upon which the householder can invite a registered contractor to quote.

This specification, which has been in circulation for close on four years, has undoubtedly proved a convenience to householders and assisted in raising the standard of electrical equipment in the home. ADAM GOWANS WHYTE.

London, W.C.2, *December 1st.*

Solid Intermeshed Distribution

In the September 8th issue of the ELECTRICAL REVIEW, in an article on the above subject, P. F. Stritzl refers to the adoption by the Berlin Electricity Works of a scheme for low-voltage network distribution with intermeshed mains similar to systems installed in about fifty cities in the United States. The author states that there are similar networks in about fifty U.S.A. towns, although the American apparatus is not suitable for pressures of 230/380 V or more.

This statement is erroneous, as I was responsible for the design, adoption and subsequent installation of American apparatus designed for the 230/400-V, three-phase, low-voltage network system now in operation in the city of Santiago, Chile. The transformers and low-voltage automatic network protectors were purchased from the General Electric Co. (U.S.A.), and the 12-kV cables from Siemens Schuckert & Co.: the majority of the low-voltage cables were of non-metallic sheath construction, purchased in America. This system was placed in operation in 1931 and, to the best of my knowledge, has given entire satisfaction. L. F. GRIFFITH.

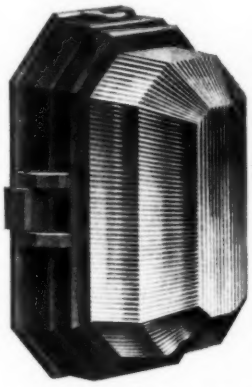
Shanghai, *October 24th.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Prismatic Lighting Fitting

The "Prismalux" has been designed for use in corridors, stairways, and similar situations, as well as in schools, hospitals, shops and stores where the character of the building demands the use of a prismatic unit of decorative appearance. The glass front embraces almost the whole lamp, which is backed by a stainless mirror. The prisms moulded on the inner surface of the glass diffuse the light, the front panel spreading the beam in the horizontal plane. A porcelain b.c. lampholder is included; the standard tapping is ¾ in. conduit at the top, but other sizes can be arranged if desired. Side or back entry can also be provided. The standard finish is green cellulose enamel, although French grey, aluminium, copper bronze, gold bronze, white, old ivory, Florentine bronze, or black finish can be obtained at the same price. A 40/60-W pearl lamp is recommended, and the overall dimensions are 9½ in. by 5¾ in. by 5 in. The fitting is obtainable from the WARDLE ENGINEERING CO., LTD., Old Trafford, Manchester, at the price of 15s. 6d.



The "Prismalux" fitting

A New Screen-grid Radio Valve

A new battery-operated 2-V screen-grid valve has been produced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2, for home constructor kit sets as a substitute for the old type without causing uncontrollable oscillation due to increased magnification and feed-back. The new valve has lower anode and screen-grid currents, a higher impedance, and a slightly higher mutual conductance than the old type, though not too high to introduce instability.

Thus the S.23 (as it is named) should effect a reduction in the total anode current consumption, combined with an increased selectivity and sensitivity and good control of tuning. A further important point is that the valve can be plugged straight into any existing home construction or kit set without any alteration whatever to the set. The same valve has been constructed to the minimum practical dimensions so that it will fit into portable receivers without difficulty. For most general purposes it is recommended that a clear bulb should be employed, although as a detector a metallised bulb is an advantage.

An Improved "Supreme" Hair Dryer

MESSRS. L. G. HAWKINS & CO., LTD., 30/35, Drury Lane, Kingsway, W.C.2, announce that the "Supreme" electric hair dryer, priced at 33s., can now be obtained with a new scenting and deodorising attachment for 35s. 6d.

A New Vacuum Cleaner

The "Silo-Baby" is a new product of C.C.A. (VACUUM CLEANERS), LTD., 138, Lever Street, E.C.1. It is a handle-type machine with an external dustbag and a universal motor loaded at 120 W, which is housed in a 4-in. diameter plated case fitted with a plug and switch.

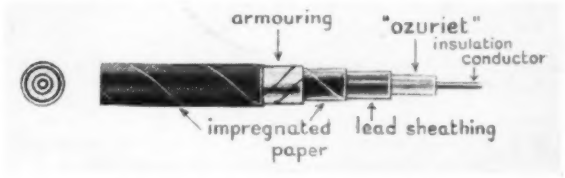
The "Silo-Baby" vacuum cleaner

For floor use the machine is assembled with the motor at the bottom and the straight tube and handle above. For cleaning curtains, &c., the handle can be detached and the cleaner held by the metal dustbag connection tube, while for dusting and furniture cleaning no handle or straight tube is necessary, the nozzle being fitted direct to the motor itself.

The equipment includes one 20-in. straight steel tube with bayonet catch connections, one 8-in. crevice nozzle for the sides of furniture and blowing, a 9-in. oval brush fitted with a rubber guard for cleaning hard flat surfaces, a 4-in. aluminium upholstery nozzle, an 8¼-in. aluminium floor nozzle for carpets, and 22 ft. of hard rubber-covered flex. The weight of the machine is 6 lb. and the price £5 12s. 6d.

Heatproof Insulation

A new insulating material called "Ozuriet," which is claimed to have the qualities of ordinary rubber insulation but to be proof against temperatures of more than 100 deg. C.



"Ozuriet"-insulated soil-heating cable

and to be able to carry a load of 30 W per metre, has been developed for soil heating by the HOLLAND INSULATED WIRE AND CABLE WORKS, Amsterdam. The cable contains no hygroscopic filling, such as asbestos yarn or tape.

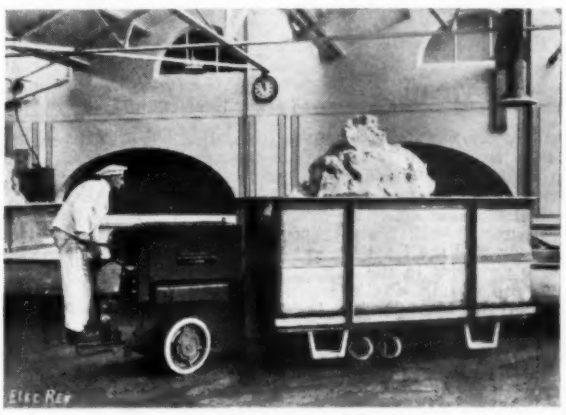
Unusual Traffic Signal Design

At the recent Public Works Exhibition MESSRS. HAILWOOD & ACKROYD, LTD., Morley, Yorks, exhibited a new two-lens traffic signal of neat design. The amber light is eliminated by the use of a flicker movement which comes into operation during the last third of the illumination period, and thus serves as a warning light. The standards are designed on artistic lines, and if necessary the green lens can be placed in a square fitted with the sides horizontal and vertical, and the red lens in a similar fitting, arranged diagonally, so that motorists who are at all colour-blind can tell by the shape which lens is illuminated

An example of the new Hailwood flicker signals

An Elevating Platform Truck

MESSRS. WINGROVE & ROGERS, LTD., Liverpool, announce an addition to their range of electric industrial trucks—a six-wheel 5-ton elevating platform truck. Goods are loaded on to a stillage platform raised 13 in. from the floor, and the truck is driven between the stillage legs. The operation



The new Wingrove and Rogers truck

of a switch raises the truck platform and stillage 4½ in. off the ground in nine seconds. The elevating motor is tripped automatically at the high and low limits, and an electric brake automatically prevents over-running. The motor can be stopped and reversed at any point.

The travelling controller has three speeds in each direction, and is interlocked with the brake pedal so that application of the brake cuts off power. For entering the stillage provision is made for inching on first speed by the use of the brake pedal only. Steering is by tiller which moves in a vertical plane and operates on all six wheels, giving a turning radius of 6 ft. 6 in. to the centre of the truck. The four-

wheel trailing axle is articulated for traversing uneven ground, and 5 in. ground clearance is allowed.

The driving and elevating motors have aluminium frames, and lightness is obtained by the use of laminated split poles. The motors are designed to withstand occasional overloads of 300 per cent., and normally work at the one-hour rating. Transmission is by totally enclosed worm gear, comprising 3½ per cent. nickel-steel worm shafts hardened and ground, and centrifugally cast phosphor-bronze alloy worm wheels. Lubrication is on the "Tecalemit" high-pressure system, the worm gears being enclosed in an oil bath.

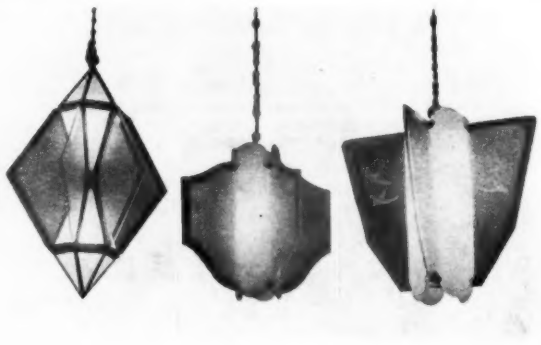
The unladen weight of the truck complete with Edison battery is 43 cwt.

Our illustration shows one of the trucks in operation at the Bromborough Margarine Works.

Modern Lighting Fittings

A large range of decorative lighting fittings has been introduced by the WALLACE ELECTRICAL CO., 9, George Street, Manchester Square, W.1, under the name "radial fittings," since in each case the fitting has vanes radiating from the centre. Three models are illustrated herewith.

The design on the left of the illustration is available with three, four or six vanes of a pale champagne colour with clear edges, and centre panels of a deeper hue, the metalwork being gilt. The right-hand fitting has clear outer edges with an obscured ground shaded in any two colours. Prices, in the case of the first model, range from £3 with three vanes, 18 in. deep, to £7 10s. for six vanes, 24 in. deep, while the second type is priced at from £6 with four 12-in. vanes to £12 with

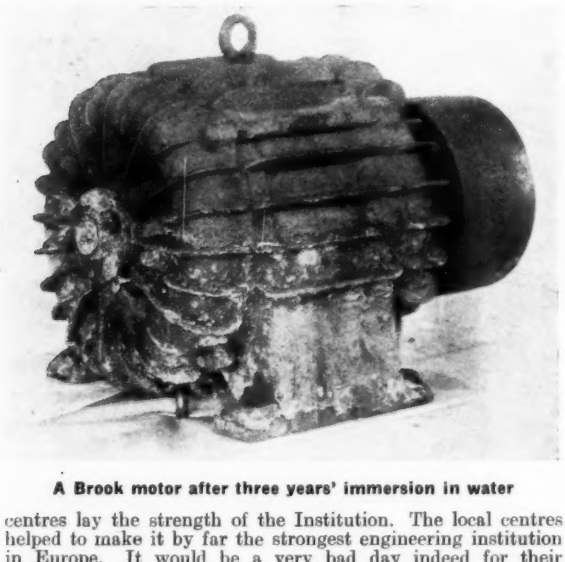


Three new Wallace "radial" fittings

six 24-in. vanes. A bracket model with three 12-in. vanes costs £5 10s.

Last Week's Dinners

THE annual dinner of the Scottish Centre of the Institution of Electrical Engineers was held in the Grosvenor Restaurant, Glasgow, on November 28th. Mr. Norman C. Bridge, chairman of the Centre, presided over a gathering of about 350. Sir Thomas Holland, Principal of Edinburgh University, proposed the toast of "The Institution," and congratulated Prof. Francis G. Baily, who lately retired from the Chair of Electrical Engineering in Heriot-Watt College, Edinburgh, on being elected to the presidency of the Engineering Section of the British Association. Mr. P. V. Hunter, President, I.E.E., replied to the toast, and said that in the strength of the local



A Brook motor after three years' immersion in water

centres lay the strength of the Institution. The local centres helped to make it by far the strongest engineering institution in Europe. It would be a very bad day indeed for their organisation if there was any tendency to curb the desires of sections of the electrical industry to form small coteries of their own. Prof. Baily proposed the toast of "The City of Glasgow and the Lord Provost," and referred to the improved trade prospects in the city. In reply, the Lord Provost said he was hopeful that Glasgow was going to have a future even greater than its past had been. The chairman's health was proposed by Mr. D. H. Bishop, past-chairman of the Centre.

Legislation for Distribution?

Mr. B. Welbourn presided at the annual dinner of the Mersey and North Wales (Liverpool) Centre at the Adelphi Hotel, Liverpool, on November 29th. Among the guests were Sir J. Brooke, vice-chairman, Electricity Commission, and Mr. R. Blackmore (C.E.B.).

Mr. Welbourn remarked that that Centre seemed to be very much in the electrical limelight at the moment; it was providing the president-elect for the I.M.E.A., which would hold its next year's conference in Liverpool. Dealing with load building he said that if authorised undertakers did not become active in this direction it might easily happen that the Government would step in with legislation for the purpose. The Lord Mayor of Liverpool (Coun. G. A. Strong, J.P.), speaking as a consumer, wondered why the electrical industry had not evolved a scheme by which electricity for lighting purposes could be charged for in rates on an assessment basis in the same way as for water.

Mr. P. V. Hunter, C.B.E. (president, I.E.E.), said that there were some who said the I.E.E. did not sufficiently strongly support its members, and asked why they were not in the same position as the medical profession or the legal fraternity. The I.E.E. existed for the advancement of electrical science and electrical engineering; nothing was said in the charter about advancing electrical engineers. Yet the efforts of the I.E.E. for the industry must certainly have been of great advantage to electrical engineers as a body, and even to individuals. Mr. P. M. Hogg proposed the toast of "The Visitors," and Mr. J. R. Robinson, M.P., responded. The chairman's health was proposed by Mr. A. C. Livesey.

Harmonious Relations

The eleventh annual dinner-dance of the West Yorkshire Section of the Electrical Power Engineers' Association took place on December 2nd, at the Hotel Metropole, Leeds, under the chairmanship of Mr. W. H. Parker. There was an attendance of some 170 people, including the Lord Mayor of Bradford (Capt. A. W. Brown); the Deputy Lord Mayor of Leeds (Councillor B. M. Goodall); and Mr. D. J. Duffy, president of the Association.

The Lord Mayor of Bradford said that it was largely due to the careful negotiating ability of the body that the electricity supply industry had been so free from disputes. He was glad to note the formation of a very important body in the way of a Joint Displacement Board to deal with the problem of displacements which might arise through the closing down of local stations.

Mr. D. J. Duffy, responding, said the credit for absence of disputes must not be claimed entirely by the E.P.E.A., though that body had done its share in the valuable work of the Whitley Council for the electrical industry. Whilst the protection of the rights of members was a main plank of the E.P.E.A. platform, it was recognised that they had obligations as well as rights. They had secured a good deal for power engineers, though not quite all they would like; but having secured so much they were determined by educational methods to respond by providing the industry with qualified men.

Mr. R. M. Longman, deputy engineer, Mid-East England Central Electricity Board, responded to the toast of "The Visitors," proposed by Mr. A. L. Lunn.

Mining Electrical Engineers

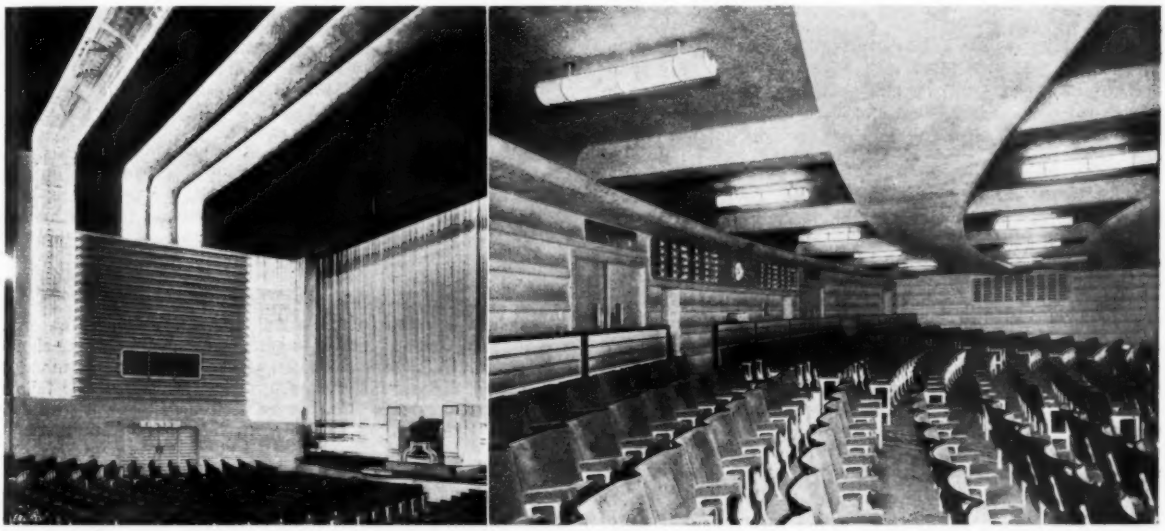
The improvements which have resulted from the application of electricity and electrical apparatus to coal mining were referred to by speakers at the annual dinner of the West of Scotland branch of the Association of Mining Electrical Engineers, which was held on Saturday last in the Grand Hotel, Glasgow. Mr. James R. Laird presided. Bailie T. S. Park proposed the toast of the Association, and Mr. Frank Beckett, past-president of the Association, acknowledging the toast, spoke of the growth of the use of electricity in mines. In the last five years, he said, more than 700 mines had been closed. Of these about 169 were using electricity, but in spite of that the h.p. installed in mines at the end of 1932 was 171,139 h.p. more than in 1927, bringing the total up to 2,000,000 h.p. The h.p. installed for conveyors had more than doubled in the last five years. The amount of coal carried by electrical conveyors was about 25 per cent. of the total cut in this country. In Scotland the figure was 39 per cent. Roughly speaking, 19,000,000 tons of coal were cut per annum in Scotland by electrical machines, and 12,000,000 tons were dealt with by electrical conveyors. These figures were about double the figures for the rest of Great Britain. Professor A. M. Bryan, replying to the toast of "The Guests," said that the West of Scotland had been a pioneer district in mining electrical engineering, in spite of adverse natural conditions. The chairman's health was proposed by Mr. A. F. Stevenson.

Imported Electrical Goods. By F. J. Tebbutt

Duties and marking procedure

THE changes which have taken place in the last two years in our import tariff system and the Orders which have been made under the Merchandise Marks Act of 1926 have put many people in a state of uncertainty regarding their obligations when they import goods into this country. This article is an attempt to clear the air a little and define the scope of recent changes.

Dealing first with the marking of imported goods, it should be particularly noted that Orders in Council are made under the 1926 Act only after a considered review by a statutory Standing Committee. But as regards all classes of merchandise, if a British firm marks imported goods with its name, or the name of a town or place in the United Kingdom, or with a trade mark, then those goods must, *ipso facto*, bear an indication of origin. This applies where foreign goods or articles are distributed by way of advertising goods of some other kind as well as on sale or exposure for sale.



The proscenium and illuminated organ and (right) the back of the auditorium of the Regal Cinema, Wimbledon. **(See note on page 824)**

The marking obligations by Orders in Council may operate by an Importation Order, where the marking requirement operates at the port of entry, or by a Sale Order, where the legal requirement commences when the goods are sold or exposed for sale in the United Kingdom. The term marking "on sale" applies to both wholesale and retail sales, but, as regards exposure for sale wholesale, the Order must specifically state whether marking so applies, and also whether the wholesale dealer is included. Also the Order must specify the manner in which the marking is to be carried out, whether by printing, embossing, stencilling, &c., on the article, on the container, by label, or by sale ticket near the goods, and other necessary particulars. Naturally the method of marking must be determined by the nature of the goods.

An indication of origin must also appear in any advertisement, illustration, or related printed matter (*e.g.*, newspapers, circulars, catalogues, &c.). It must also appear on samples, but in this connection the obligation is met if, when the samples are submitted, there is a written communication accompanying them, giving the necessary information. The requirement is met, in any case, by the one word "foreign" or for goods of Empire origin by the one word "Empire." Alternatively, at the option of the person responsible for the marking, the name of the country of origin may be used.

Marking Orders in Force

Up to the present date Importation Orders have been made in respect of insulated electric cables and wires;* electric incandescent lamps;* and electricity meters.* Sale Orders have been made covering implements and tools of various kinds; adhesive insulating tape for electrical purposes; cases for portable electric lamps, lanterns, or torches, containing or intended to contain a dry or secondary battery;* rubber manufactures (including sheets, insertions and jointing, hose and tubing and gloves); and electrical accessories (including lampholders, ceiling roses, lampholder adaptors, switch-plates, and articles up to and including 30-A rating of the following descriptions: Switches, cut-outs, fuses, wall sockets, plugs for wall sockets, plug adaptors for wall sockets, and plugs and sockets for use as connectors to portable or mobile appliances*). Those marked with an asterisk require marking on exposure for sale wholesale, whether or not the submitter is a wholesale dealer or not. In the case of those not so marked on exposure for sale wholesale, marking is excluded for the wholesale dealer. The marking of electric clocks has been recommended by the Standing Committee, but no Order has yet been made.

The Fiscal System

The main principle of the fiscal system is that, unless included in the Free List or specially mentioned in the Safeguarding of Industries Act, 1921 (Key Industry Duties), the Finance Act, 1925 (McKenna Duties), several other Finance Acts (Budgetary Duties), Ottawa Agreements Act, 1932, or an Additional Duties Order, all goods are chargeable with the general tariff of 10 per cent. *ad valorem*. The Free List is a short list of goods non-dutiable, scheduled to the Import Duties Act, 1932, and subsequent Exemption Orders, and the Ottawa Agreements Act, 1932. An Additional Duties Order is brought into force following a recommendation by the Import Duties Advisory Committee, and such a duty is additional to the general 10 per cent. tariff. An additional duty cannot be recommended unless goods are already chargeable with the general 10 per cent. tariff or an Ottawa Agreements Act duty, but the Committee, by removing any description from the Free List, brings those goods on to the 10 per cent. general tariff, and a review for an additional duty can then follow.

No reduction of the 10 per cent. general tariff can be recommended ordinarily, but by placing a description on the Free List the whole 10 per cent. can be removed. The Finance Act, 1933, however, gives certain additional powers to the Committee whereby, if it is thought more convenient so to do, a specific duty, by reference to weight or other measure of quantity, may be substituted for the general *ad valorem* duty; this is allowable even though the resulting duty may work out at more or less than exactly 10 per cent. of the value. As an example, suppose there is a specific duty of 3d. a unit placed on any class of goods of which there may be two or three qualities, say 5s., 2s. 6d., and 1s. 3d. On the 5s. article the duty would be less than the 10 per cent., on the 2s. 6d. equal, and on the 1s. 3d. more than the 10 per cent.

It is provided, however, that where the Committee makes such a recommendation the duty must be such as appears to it to be approximately equivalent to 10 per cent. of the current average import value of the goods, and where there are seasonal variations in the value consideration must be given to this aspect also.

Although, as shown, generally the Committee cannot interfere with the 10 per cent. tariff, the Government (F.A. 1933) has power to do so in the making of commercial agreements with any foreign nation, and the Order can be made to apply to all countries or to any nation expressly mentioned in the

Order. This is to strengthen the hands of the Government in any negotiations for new agreements, but it might be useful to point out that at present, as most agreements include the most-favoured-nation clause—there are forty-one such agreements—any Order must apply generally, even though the agreement making alterations may be with only one country. Of course, there is general Governmental power to vary any Order made, and if discrimination is thought to have been exercised against us by any foreign nation, comparative with duty terms and procedure given to another nation, duties additional to any other duties of anything up to 100 per cent. of the value may be imposed. Moreover, total prohibition of foreign goods may be made where, by State action, any Imperial preference seems likely to be frustrated by dumping.

A further negotiating instrument has arisen out of the Anglo-German agreement. Although certain descriptions of the McKenna duties have been lowered from the general flat rate of 33⅓ per cent. *ad valorem* of those duties, to duties varying from 10 per cent. to 25 per cent., in consequence of the agreement, power is taken (F.A. 1933) to revert to 33⅓ per cent.—by Order, without further legislation—to apply to any or all of the duties that have been lowered, and an Order may apply to all or to one or any country expressly mentioned. At present, as explained earlier, any new reduced duties apply generally, and that explanation applies in this case also.

Re-exported Goods

Foreign goods intended for re-exportation can be imported free of duty, providing certain Customs rules are observed; even processes and repairs can be carried out if the form and character of the goods are not changed. Both British and foreign goods exported and reimported may be readmitted free of duty or at reduced rates. If process has taken place without the form and character of the goods having been changed, then duty is only payable on the increased value of the goods or the cost of the execution of the process.

Drawback (refund of duty) is allowed subject to a recommendation of the Advisory Committee in the case of foreign goods exported in the same state as received and not used, and also in the case of any foreign materials necessarily used in the manufacture of British goods upon being exported. Both provisions also apply if goods are shipped as stores or delivered into a United Kingdom shipyard. A further drawback provision is introduced by the Finance Act, 1933, power being given to the Customs authorities, to refund duty paid on imported goods which have been returned to the seller unused by reason that the description, quality, or condition of the goods was not up to contract, or the goods were damaged in transit. Goods imported on approval, or on sale or return, are not included in this provision.

Empire goods are of course imported free of duty in most cases; goods in the McKenna duties category are subject to two-thirds of the ordinary rates of duties. The general *ad valorem* duties and additional duties apply to the Irish Free State, that country not being a party to the Ottawa Agreements Act, and any special duties imposed by the Irish Free State (Special Duties) Act, 1932, are added to other duties.

Duties on Electrical Goods

The following electrical goods are subject to a total duty of 20 per cent. *ad valorem*:—Electric wires and cables, insulated; telegraph, telephone and wireless apparatus; electric carbons (other than amorphous carbon electrodes over 3 ft. long, the cross section of which exceeds 12 in. in both length and breadth, with longitudinal slots, exceeding 2 in. in width and 4 in. in depth); electric lighting appliances and fittings (other than glass bulbs for electric filament lamps); batteries and accumulators; electric bell apparatus; electric cooking and heating apparatus; electric meters; parts of and accessories to the above; rubber manufactures (other than sheets, piping, tubing and rods); balata or gutta-percha, including vulcanite and ebonite, included in this description.

It should be noted that the exceptions mentioned above come under the 10 per cent. general tariff, in accordance with the general rule of complete manufactured goods being chargeable with a total duty of 20 per cent. and over, semi-manufactured mostly 10 per cent. (especially when used as raw materials by other trades), and raw materials allowed in free. As an example, glass bulbs for lamps are charged 10 per cent., and complete imported lamps 20 per cent.

Under the Key Industry Duties come wireless valves and similar rectifiers and vacuum tubes (33⅓ per cent.); ignition magnetos and permanent magnets (33⅓ per cent.); arc-lamp carbons (1s. lb.); amorphous carbon electrodes (but not including primary battery carbons or arc lamp carbons (33⅓ per cent.); and certain scientific instruments (33⅓ per cent.).

Drawback on Component Parts

Under the rule of refund of duty on goods being exported in the same state as received and not used, the following should be noted. Allowance is made for component parts made of ebonite or similar material of electric batteries, of the following descriptions: (a) Containers of dimensions not less than 22 in. by 14½ in. by 35½ in.; (b) lids for accumulators, of dimensions not less than 21½ in. by 13½ in.; (c) separators, *viz.*, (1) corrugated and perforated sheets of dimensions not less than 29¾ in. by 12¾ in., (2) rods not less than 29¾ in. in length and not less than 0.09 in. in diameter. Machinery and parts and tools also are allowed drawback under this rule. Drawback is similarly allowed on Key Industry goods.

The following items if 50 per cent. of their value is derived from expenditure in an Empire country in respect of Empire materials, or work done in an Empire country (or the United Kingdom, of course) come into the category of Empire goods for the Imperial preferential duties: Various scientific instruments; arc lamp carbons and amorphous carbon electrodes; wireless valves and similar rectifiers and vacuum tubes; ignition magnetos and permanent magnets; electrical goods (mostly including the list already given under "Duties on Electrical Goods"); and rubber manufactures.

In the Courts

IN the King's Bench Division on November 30th the hearing was continued before Mr. Justice Branson of the action brought by Vulcan Foundry, Ltd., against Associated Electrical Industries, Ltd., to recover from the defendants, as the successors of the Metropolitan-Vickers Electrical Co., Ltd., the balance of the price (about £42,000) of the mechanical parts of thirty-one electric freight locomotives for use on the Great Indian Peninsula Railway. The only question the Judge had to decide was whether the plaintiffs agreed to make the mechanical parts of the locomotives for a reasonable price, no price being fixed, and the contract not having been reduced into writing. By their defence, the defendants set up nine alternatives to the contract, and pleaded a couple of estoppels.

Mr. F. S. Whalley, the managing director of the plaintiff company, in cross-examination by Mr. Singleton, K.C., appearing for the defendants, said they agreed that in July and August, 1929, there was a discussion as to whether the legal claim should be dropped. In September, 1929, his company put forward a claim for submission. It was not meant to be a total claim. A letter, dated March, 1930, showed that at that time the sum claimed to be due amounted to £26,939.

Mr. Charles Finlayson, chief draughtsman of the Vulcan Co., gave detailed evidence in connection with the drawings.

Mr. A. C. Carr, a consulting electrical engineer, giving evidence, said that if instead of introducing Swiss practice the original drawings of the Vulcan Co. had been adhered to it would have made a quite satisfactory job. It was not the fact that locomotive practice was necessarily inapplicable to the mechanical parts of electrical engines.

Sir Seymour Tritton, M.Inst.C.E., M.I.Mech.E., of Palmer & Tritton, consulting engineers to the Government of India, also gave evidence and the plaintiffs' case was closed.

Mr. Singleton, K.C., in opening the case for the defendants on December 1st, said his submission was that there was nothing due to the plaintiffs either on the claim for mechanical parts or on the claim for spares. The Vulcan Co. was asked to tender for that work and knew the purpose for which the tender was wanted, *i.e.*, to include it in the defendants' tender to the High Commissioner for India. He contended that the basis of the contract was that £5,397 should be paid for each set of mechanical parts subject to extras. The plaintiffs must be taken to have agreed that any alterations which might be made from time to time should be paid for on that basis and that the plaintiffs could not now say that they would not be bound by the £5,397 basis. The defendants had put forward that the sum would be £5,319 and not £5,397, but they would agree that the higher figure should be taken as the proper basis. There could be no doubt that the contract between the Metropolitan-Vickers Co. and the High Commissioner was based on the Vulcan Co.'s tender for the mechanical parts.

Counsel dealt at great length with the correspondence for the purpose of showing what the contract between the parties was. He contended that it showed that there was an understanding between everybody concerned that they and the consulting engineers on both sides should collaborate both on the question of design and manufacture. Here they found a main contract at fixed prices and a sub-contract at fixed prices.

Under the conditions and the specification the sub-contractors made an effort to bring in clause 12 of the contract. If the defendants passed that on to be dealt with by the High Commissioner and he dealt with it his decision was final. If it was not passed on then he (Counsel) could well see that was proper subject matter for arbitration under the terms of the contract. He argued that on the proper construction of the correspon-

dence and the evidence of Mr. Whalley the plantiffs had contracted to make the mechanical parts of the engines on the £5,397 basis.

Mr. Singleton, in continuing his address for the defendants, dealt at length with the correspondence and with the evidence given on behalf of the plaintiffs with reference to the various drawings which, Counsel submitted, had been agreed. The plaintiffs knew that the defendants had contracted with the High Commissioner and in making that contract had been working on the basis of fixed prices and now the plaintiffs said they did not intend to be bound by their tender of £5,397, and that as there had been a departure from the original design they were entitled to extra prices. But the correspondence clearly showed that fixed prices were always pre-supposed.

The plaintiffs said that there was no contract for fixed prices and asked to be entitled to "reasonable prices." But the fact was that both parties had been working on the basis of a contract at fixed prices. There could be no doubt that there was a contract for a fixed price and the question was what was that price? His submission was that it was £5,397. He contended that the plaintiffs in the circumstances must be taken to have agreed that there would be slight variations from the contract from time to time. The plaintiffs could not be heard to say that they wanted prices left at large, namely, reasonable prices.

Mr. P. S. Turner, a director of the Metropolitan-Vickers Co., was the first witness called for the defendants. At the end of 1925 he had indicated to the plaintiffs that there was a prospect of the Indian Peninsula Railway wanting locomotives. When the specification was submitted he had some idea of what might happen and what might be wanted. In preparing the tender to the High Commissioner it was of course necessary to have details of what the various parts of the work would cost.

So far as he knew there had never been built in England before any side rod drive electrical locomotives. He was actually responsible for the making up and filling in of the actual tender to the High Commissioner. Before he left England for Australia in November, 1926, he had heard of no question being raised as to prices. He agreed that in July, 1929, in an interview with Mr. Whalley, the question of the claim of the Vulcan Co. for some extra payment was discussed.

Cross-examined by Sir Leslie Scott, the witness said he believed interviews had taken place with the Vulcan people in connection with the investigation of the company's claim for extras. It was not the fact that by arrangement he had agreed with the Swiss company that Vulcan Co. should not be told what they were arranging with the Swiss people until they had decided what course to take. Down to the time the head contract was signed there was what was described as the evolution of designs. He (the witness) resented the suggestion which had been made that he had acted in an underhand way towards either Mr. Whalley or the Vulcan Co.

The hearing was again adjourned.

The new lighting at Kingston referred to on page 823

Fraudulent Consumption of Electricity

William J. Winchcombe, an electrical dealer, Stockport, was fined £5 at Stockport recently for the fraudulent use of electrical energy. Defendant was supplied by the Corporation with electricity, but he got into arrears with his accounts to the extent of over £8 and on July 10th he was disconnected. Then it was suspected that he was using electricity and inspectors found that the seals had been broken and that the installation had been connected direct with the mains, the meter having been cut out.

Defendant said that he offered to pay half the account owing if the Electricity Department would re-connect him, but his offer was refused. Electricity was essential to his business, and he succumbed to the temptation to re-connect the supply.

Parliamentary News

(BY OUR SPECIAL REPORTER)

IN the House of Commons on November 29th Major Nathan asked the Minister of Transport if he was able to make any statement as to the projected electric railway from Liverpool Street, *via* Bethnal Green, to Ilford and beyond.

Mr. Stanley said that this was one of the questions which were now under consideration by the Standing Joint Committee of the main-line railway companies and the London Passenger Transport Board.

On November 29th Major Nathan asked whether any action was being taken on the report of the Weir Committee on the electrification of the main-line railways.

Mr. Stanley said that the railway companies were continuing to give consideration to this matter.

The Severn Barrage

On November 30th Mr. Mander asked the Minister of Transport if he would state the present position with regard to the Severn Barrage scheme and other proposals made in relation thereto.

Mr. Stanley said that before giving further consideration to this matter it was proposed to await any views which the local and other authorities affected by this far-reaching and costly scheme might wish to submit upon the Severn Barrage Committee's report.

The Case of Minchinhampton

On December 1st Mr. Perkins asked the Minister of Transport whether he would make representations to the Electricity Commissioners with the object of securing electricity for Minchinhampton, Gloucestershire.

Mr. Stanley said he was informed that the Electricity Commissioners were investigating the question whether a supply of electricity could be given in Minchinhampton.

From Grid to Consumer

On December 1st Mr. Rhys Davies asked the Minister of Transport if he would state the rate charged per kWh by the Central Electricity Board to authorised supply undertakings; the cost incurred by the undertaking in transmitting the electricity to the domestic consumer; and the rate charged per kWh by the supply undertaking to the domestic consumer.

Mr. Stanley said that the grid tariffs of the Central Electricity Board for bulk supplies to authorised undertakers were two-part tariffs involving a kW charge component and a unit charge component, while the charges made by undertakers to domestic consumers for lighting and other supplies comprised a variety of flat rates and two-part tariffs consisting of a fixed charge and a unit charge which might differ in different areas. In the circumstances, the question did not admit of a general answer.

The Lighting of Hospitals

On December 4th Mr. Thorne asked the Minister of Health whether he was aware that at many hospitals the electric light had failed while patients were about to undergo, or were undergoing, operations; and if he would appoint a committee to inquire into these cases with a view to making some form of alternative lighting in hospitals compulsory.

Mr. Shakespeare said that the Minister had no information to show that this difficulty had occurred except on rare occasions, and he did not think that a committee of inquiry was necessary. If, however, the hon. member would give particulars of any cases that had been brought to his notice, the Minister would have inquiries made.

Abolition of Tramways Proposed

On December 4th Sir William Brass asked the Minister of Transport whether, with a view to bringing the transport system of the whole country up to date and to stimulate employment in the heavy industries, he would consider helping the local authorities to finance schemes for the early abolition of all tramway systems in their areas with the substitution therefor of trolley omnibuses or motor omnibuses, as the local conditions warranted.

Lieut.-Col. Headlam said he was not aware that substitutions of this kind were hampered by financial difficulty where they were justified on economic grounds, but in any case he would feel unable to propose that national funds should be expended on local purposes of this kind.

Business and Industrial Notes

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations, and Failures

The Christmas Holidays

Owing to the Christmas holidays, it will be necessary for our issue of December 29th to be printed earlier, and in consequence advertisement copy and blocks must reach our Advertisement Department not later than Monday, December 18th.

Broadbents of Huddersfield

The business of Messrs. Thomas Broadbent & Sons, Ltd., of Central Ironworks, Huddersfield, photographs of whose directors appear in this week's group in our series of "Driving Forces in the Industry" (page 799), was founded in the year 1863 by the late Mr. Thomas Broadbent, whose second son, the present chairman and managing director, Mr. Horace Broadbent, was apprenticed to his father in the year 1878, was made a partner in 1884 and a director in 1895. He is able to count amongst his other achievements pioneering work in connection with hydro-extractors and electric cranes. In July last his co-directors and the staff presented him with a souvenir album and a silver salver to commemorate his fifty-five years' connection with the company. He is still actively engaged in this and other interests. Mr. Brian L. Broadbent, the general manager, is at present in India on business. Amongst work at present engaging Messrs. Broadbent's attention is the mechanical and electrical machinery which they have designed for the operation of the Tees (Newport) Bridge. The bridge, which is nearing completion and will be opened early in the New Year, will be the largest vertical lift bridge in Europe. It has been constructed by Messrs. Dorman, Long & Co.

New Electricity Showrooms at Carshalton

The urban district of Carshalton is a rapidly growing residential area, and is a comparatively new one from the electrical point of view. Prior to July, 1932, the South Metropolitan Electric Tramways and Supply Co. was the supply authority for Sutton and district (which includes Carshalton), and at June 30th, 1932, the number of consumers in the area was 21,447 (Carshalton 5,852), and the total connections were 23,564 kW. The electricity supply section of the company's undertaking was taken over by the London and Home Counties Joint Electricity Authority on July 1st, 1932, and since that date the number of consumers in Sutton and district as a whole has increased by 8,253, and in the Carshalton urban district by 1,933 or 33 per cent. The establishment of showrooms in Carshalton, therefore, followed as a natural course, and these were formally opened on November 30th by Councillor Mrs. K. M. Baker, chairman of the Urban District Council. The showrooms are situated on a prominent site in the High Street and the brilliantly illuminated windows provide an attractive addition to the town's shopping centre. The showrooms are tastefully decorated with panelled walls, and in addition to a varied and well-arranged display of lighting fittings and other domestic appliances a portion of the showrooms has been set apart as an electric kitchen, where it is intended to give periodical demonstrations of electric cooking. Two-part tariffs are in operation in the district, consisting of a fixed annual charge according to the size of the house, plus ½d. per kWh during the summer quarters and ¾d. per kWh during the winter, in the case of domestic supplies, and special charges for business premises. The J.E.A. has also introduced hire and hire-purchase schemes, and with these aids the new showrooms should play an important part in the electrical development of the district.

Exterior and interior views of the new electricity showrooms at Carshalton

New Municipal Showrooms

Stockport Corporation Electricity Department has opened a new showroom at Tiviot Dale, for the display of water heaters, washing machines, boilers, cookers, geysers, radiators and clocks, besides the latest designs of lighting fittings.

The new showrooms of the Weymouth Corporation Electricity Department were to be inaugurated on Wednesday last.

Import Duties Advisory Committee

The Import Duties Advisory Committee has given notice of an application for the addition to the free list of certain imported goods including cable cores produced by stripping used submarine electric cables. Any representations in regard to this application should be made to the secretary of the Committee, Caxton House (West Block), Tothill Street, S.W., not later than January 1st next.

The Committee announces that it has decided not to make any recommendation in respect of the application previously advertised for the imposition of an additional duty on carbon rods of all sizes for electric batteries.

Floodlighting

We have received from the General Electric Co., Ltd., an excellently produced publication dealing with floodlights and floodlighting. This contains examples of all classes of floodlighting, both white and coloured, and numerous illustrations show its application to all kinds of buildings, gardens, landscapes, pageants, &c. The publication also deals with the science of floodlighting, and touches on the research and development incidental to modern floodlighting practice, while several pages are devoted to technical notes and a general glossary of floodlighting terms.

"Magicoal" Fire Competition Result

Referring to the competition advertised in the ELECTRICAL REVIEW, by Berry's Electric, Ltd., in which prizes were offered for the closest estimates of the number of "Beauberry Magicoal Plus" fires sold during August, September and October, the company announces that the following were nearest to the correct figure, and a "Beauberry" fire has been awarded to each: Messrs. S. Bull (Bournemouth), J. I. Cullen (Highbury, N.), F. Jones (Llandudno), A. Lascelles (Liverpool), J. E. Martin (Forest Hill, S.E.), and E. J. Riordan (Willesden Lane, N.W.).

Polish Radio Imports

Poland is gradually becoming independent of outside sources of supply of radio apparatus. During the nine months ended September last imports of these goods were valued at only 500,000 zl., as compared with 1,400,000 zl. and 4,300,000 zl. during the corresponding period of the two preceding years. Imports of valves have also fallen, while those of transformers, etc., were only 600,000 zl. in value as compared with 1,100,000 zl. and 2,600,000 zl., respectively, during the first nine months respectively of 1932 and 1931. While general depression partly accounts for the diminution, the chief reason is the growth of local manufacture. There is a telephone and radio works in Warsaw which undertakes the manufacture of complete transmitting stations. Radio valves are not made

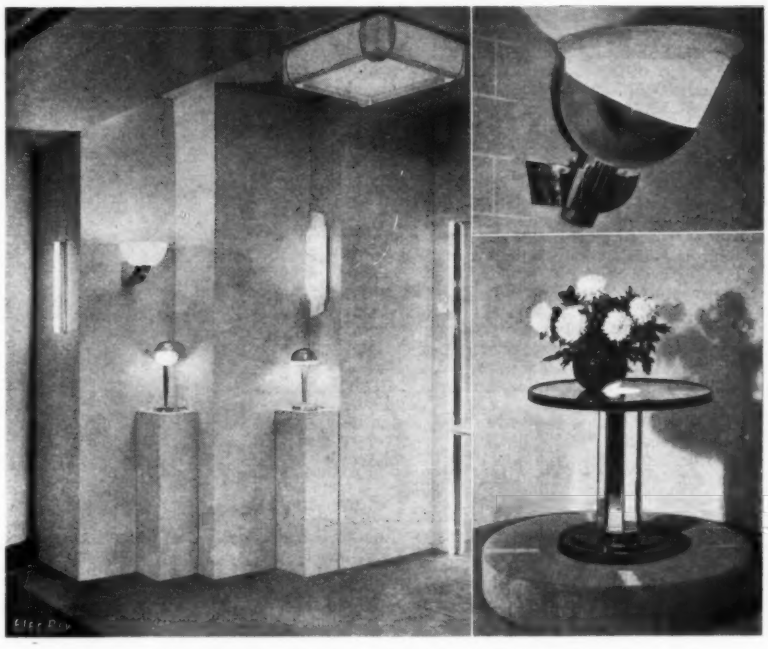
entirely in the country but to the extent of two-thirds are assembled from imported parts, while a number of small undertakings manufacture various parts for sets.

A Paris Lighting Exhibition

The recent Salon de la Lumière, in Paris, was an interesting manifestation of the importance of lighting in the home and elsewhere. This Salon was held under the auspices of O.C.E.L. in the Boulevard Haussmann, and was organised by M. Marcel Roche. A carefully arranged and brilliantly displayed show, it contained the work of some of the finest artists in France.

It was clear that the aim was to produce lighting which will fit into modern decoration. It must be distinctive, but at the same time must fulfil its primary function.

Most of the lighting was of the indirect type. The artistic element combined with novelty was to be found in tables in which lamps were concealed. These were arranged with care and taste, and the question of reflection had been studied. Simplicity was the rule in the general lighting of the show. The Salon was intended to show decorative lighting and not lighting as an appurtenance to decoration. For this reason the general arrangements were of the simplest kind with full value given to the actual illumination.



Examples of decorative lighting at the Paris Salon

E.D.A. Activities

The third sales conference of the Winter session of the North Midland Area of the British Electrical Development Association was held in Leeds on November 30th, when a lecture on "Electric Hotplates" was delivered by Mr. O. W. Humphreys. Mr. Humphreys gave a brief historical survey of the development of electric hotplate manufacture, and said that even in 1900 there were a variety of hotplates on the market. They were not too successful, but the appearance of the nickel-chrome alloy led to a great advance in manufacture. Much higher temperatures were rendered possible, although mica became unsuitable owing to its disintegration at such temperatures. During the years 1914 to 1929 greater development took place with the appearance of machine-wired elements, coiled resistors, and grooved refractories. Higher loadings were sought, quicker boiling time being essential. The average life of a hotplate to-day should be between 3,000 and 4,000 hours. A discussion followed. Mr. C. E. Allsop presided, and about seventy engineers and contractors were present.

The Association has published the Christmas number of *Electrical Housekeeping*. This contains articles by Harry Edmonds, Mary Gwynne Howell, Mabel Askew, and Dorothy Vaughan, while several well-known stage and screen stars contribute their views. A number of suggestions for electrical gifts are illustrated.

Social Events

On December 12th the official "Exide" dance and cabaret will be held at Tony's Major Ballroom, Birmingham, and

The Anchor Operatic Society in a scene from "Silver Wings"

over 400 people are expected to be present. Tickets are obtainable from Exide Batteries, 57-58, Dale End, Birmingham.

Mr. T. A. G. Margary (borough electrical engineer), speaking at the recent dinner of the Wolverhampton Electricity Department's Sports and Social Club, said it had been a strenuous year for the Department. Sales of electricity had gone up since March, and compared with the same period last year, were 8,250,000 kWh more, which represented an increase of about 12½ per cent. on the corresponding period of last year.

The Operatic Society of the Anchor works of Callender's Cable & Construction Co., Ltd., Leigh, Lancs, recently concluded a successful week's performances of the musical play "Silver Wings," which was staged in the Leigh Hippodrome during the week ended November 25th. The Society has reached a very high standard. The principals, along with a chorus making a total of about sixty-five, gave a finished performance. The Society owes much of the success to the producer, Mr. F. Hartley, and the musical director, Mr. Joseph Hull. The Anchor Orchestra provided the music. Friday night's performance was witnessed by Sir Malcolm Fraser, Mr. and Mrs. Tom Callender and Mr. T. Petersen.

Trade Announcement

Edison Swan Cables, Ltd., has transferred its head office from Queen Victoria Street to 155, Charing Cross Road, W.C.2. Telephone: Gerrard 8660; telegrams: "Nawside, Westcent, London."

For Sale

Batley Corporation Electricity Department has for sale two 159 kW Bellis & Morcom engines, direct coupled to two John Fowler generators.

Islington Borough Council invites tenders for the dismantling, removal and purchase of redundant boiler house plant.

(See our classified advertisements.)

Calendars

A charming blonde has been selected by Messrs. Gabriel Wade and English, Ltd., for the picture entitled "Symphony in Blue," from a painting by W. E. Webster, which adorns the company's calendar for 1934.

The 1934 calendar of Messrs. Ruston & Hornsby, Ltd., has monthly sheets with bold figures surmounted by illustrations of the company's principal products.

Malayan Electrical Imports

Imports of electrical goods into Malaya during the first half of 1933 totalled £120,897, as compared with £155,313 during the corresponding period of 1932.

C.W.S. to Make Radio Sets

It was announced this week that the agreement between the Co-operative Wholesale Society and the Radio Manufacturers' Association had been terminated, and that the C.W.S. had made arrangements to supply its own sets to co-operative retail societies.

Polish Railway Electrification Scheme

A *Reuter* message from Warsaw states that representatives of the English Electric Co., Ltd., and Metropolitan-Vickers Electric Co., Ltd., are visiting Krakow and Zakopane to investigate the proposed £1,350,000 scheme to electrify the railway between the two towns. Several French electrical companies have already tendered for this work, and a large Swedish firm is also interested. The plans prepared by the two English companies for the electrification of 125 miles of railway track in Warsaw have been submitted to a committee of Polish experts. The examination of the plans is expected to take about a month.

Electric Flats in Bayswater

That the policy of the Metropolitan Electric Supply Co. of a moderate tariff for electricity in the extensive residential area of Bayswater is being fully justified is borne out by the increasing preference for electrical services which is being shown by the proprietors of private hotels, boarding houses, and mansion flats. Ilchester Chambers, a large building situated at Ilchester Gardens, Bayswater, containing 131 residential chambers, is an example of up-to-date reconstruction and electrical re-equipment. Every room is fitted with a 3-kW "Magnet" electric fire with an independent meter, and a 5-A socket for connecting up an electric kettle or other domestic appliance. Tenants of these chambers have all meals in the general restaurant on the ground floor, and the all-electric kitchen and servery equipment, which is designed for an average output of 300/400 meals per day, was supplied by the G.E.C. The kitchen equipment includes a double oven range, a two-pan fish fryer with draining racks and swill ledge, a steaming oven, a vegetable boiler, and a 12-gallon stockpot. The servery (shown in the accompanying illustration) has a hot cupboard, a bain marie, a toaster-griller, two 5-gallon water boilers, a coffee percolator, and a 2-gallon milk urn. The proprietors, the Lancaster Gate Chambers, Ltd., have duplicated the entire equipment in the more recently opened block of seventy-five similar residential chambers at Park Chambers, Queen's Gardens. The wiring installation in both establishments was carried out by Messrs. Blackburn Starling & Co., Ltd., electrical engineers, of Victoria Street, S.W., in collaboration with the architects, Mr. F. E. Jones and Mr H. C. Wilkinson.

An all-electric servery in Bayswater flats

The Timber Market

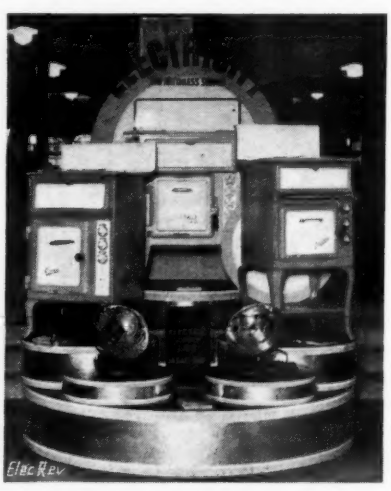
Our Timber Trade Correspondent reports that the seasonal lull in the market for building woods is not so pronounced as in recent years at this time. Imports have been heavy, and stocks for winter and early spring are accumulating. In the hardwood section mahogany has been in good demand at higher prices on account of the shortage of supplies in first hands. The demand for the hardwoods generally is better than last year, but the fancy woods are still in but small request.

Egyptian Electrical Manufacture

The manufacture of incandescent electric lamps is progressing in Egypt under the auspices of an electrical manufacturing company which was started in Alexandria three years ago. This concern has been gradually widening the scope of its production which now includes insulating tubes, circuit-breakers and electric bells, as well as a range of small electrical accessories. Sales organisations are maintained in Cairo and Alexandria, while efforts are being made to find outlets in the Sudan, Palestine, Iraq and Persia.

An Electrical Display in a Newspaper Office

A new departure in electrical propaganda has been taken by the Birmingham Electric Supply Department which has arranged a display in the hall of the head office of the *Birmingham Gazette*. The exhibit comprises three models of cookers and two fires on a specially designed stand, with a number of discs coloured in shades of blue as a background. As the hall is visited by hundreds of people daily, the display is an excellent way of popularising electricity in the home.



A Birmingham Electricity Department display in a newspaper office

The Bristol Electric Club

The Christmas dinner of the Bristol Electric Club will be held at the Royal Hotel, Bristol, on December 15th, when the principal guest will be Mr. E. A. Wilshire.

American Electrical Exports

Exports of electrical machinery and apparatus from the United States during the twelve months ended June last were $2,044,276 in value, as compared with $2,897,462 during the preceding year. The decline was specially marked in batteries, the value of which fell from $205,000 to $155,000, or by about 25 per cent; and in wireless transmitting sets, tubes and parts, from $146,000 to $13,000. Practically all important lines, however, showed decreases, the only noteworthy exception being generators and parts, exports of which were $102,000 in value against $76,500 in the year ended June, 1932.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, December 6th.	Fortnight's Inc. or Dec.
a Acid, Oxalic ... ... per cwt.	50s.	—
a Ammoniac, Sal ... ... per ton	£40	—
a Ammonia, Muriate (large crystal) ... ,,	£38	—
a Borax ... ... ,,	£17	—
a Copper, Sulphate ... ... ,,	£19 15s.	—
a Potash Chlorate ... ... per lb.	3¾d. to 4¼d.	—
a ,, Perchlorate ... ... ,,	6d.	—
a Shellac T.N. ... ... per cwt.	£3	—
a Sulphur Commercial... ... ... per ton	£11	—
a ,, Roll ... ... ,,	£11	—
a Soda Chlorate ... ... per lb.	3½d. to 3¾d.	—
a ,, Crystals... ... ... per ton	£5 to £5 5s.	—
a Sodium Bichromate, casks ... ... per lb.	4d. less 6 per cent.	—
METALS, ETC.		
b Aluminium, Ingots ... ... per ton	£100 to £105	—
b ,, Wire ... ... per lb.	1/1 to 1/9	—
b ,, Sheet and Foil... ... ,,	1/2 to 2/9	—
p Babbits Metal and Anti friction Metals—		
Grade I ... ... per ton net	£203	£1 dec.
Grade II ... ... ,,	£140	—
Grade III ... ... ,,	£69	—
c Brass (rolled metal 2" to 12" basis) per lb.	6¼d.	—
c ,, Tubes (solid drawn) ... ... ,,	8¼d. to 9d.	—
c ,, Wire, basis ... ... ,,	7¾d.	—
c Copper Tubes (solid drawn) ... ,,	9¾d.	—
g ,, Bars (best selected)... ... per ton	£60	—
g ,, Sheet... ... ... ,,		—
g ,, Rod ... ... ,,		—
d ,, (Electrolytic) Bars ... ... ,,	£42	—
d ,, ,, Sheets ... ,,	£64	—
d ,, ,, Wire Rods ... ,,	£42	10s. dec.
d ,, ,, H.C. Wire ... per lb.	6½d.	¼d. dec.
f Ebonite Rod ... ... ,,	1/3 to 1/6	—
f ,, Sheet ... ... ,,	1/3 to 1/6	—
n German Silver Wire ... ... ,,	2/2	—
h Gutta-percha, fine ... ... ,,	nom.	—
h India-rubber, Para fine ... ... ,,	4¾d.	¼d. dec.
i Iron, Pig (Cleveland No. 3) ... per ton	62/6	—
i ,, Wire galv. No. 1, P.O. qual. ,,	£20	—
g Lead, English Pig ... ... ,,	£13	5s. inc.
g Mercury ... ... per bot.	£9 10s. to £9 15s.	5s. dec.
e Mica (in original cases) small ... per lb.	6d. to 3/6	—
e ,, ,, medium ... ,,	4/- to 8/-	—
e ,, ,, large ... ,,	8/6 to 17/6 & up	—
p Phosphor Bronze, plain castings ... ,,	1/1	—
p ,, ,, drawn bars & rods ,,	11d.	—
p ,, ,, rolled strip & sheet ,,	11d.	—
p ,, ,, wire ... ... ,,	11½d.	¼d. dec.
o Platinum ... ... per oz.	£7 15s.	—
d Silicium Bronze Wire ... ... per lb.	8d.	¼d. dec.
r Steel, magnet, in bars ... ... ,,	7½d.	—
n Tin, Block (English)... ... ... pet ton	£228 to £230	5s. dec.
g ,, Wire, Nos. 1 to 16 ... ... per lb.	3/5	—

Quotations supplied by:—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons
f India-Rubber, Gutta Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson Matthey & Co.
p C. Clifford & Sons, Ltd.
r W. R. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead and rubber, up to the time of going to press, are given in our "Business Notices" under the same heading.

A Hardy Motor

On page 812 of this issue we illustrate a surface-cooled motor made by Brook Motors, Ltd., which has successfully withstood a test of running immersed in water for three years. The general condition of the carcase shows the severe conditions under which the motor has operated, and it will be seen that the eyebolt is partly rusted away. It was found difficult for the water to be kept from the inside of the motor, so this was drained away by the small pipe seen on the left, the thorough impregnation of the electrical windings being sufficient to withstand the action of the moisture. The company states that although such severe conditions are rare there are some installations where these motors are working at the bottom of wells and have continued to run through periods of total immersion without the water doing the motors any harm.

An Electric Motor and Control Gear Demonstration

During the current week a demonstration of electric motors and control gear for industrial purposes has been held in the demonstration workshop of the Manchester Corporation Electricity Department, arranged with the co-operation of the British Thomson-Houston Co., Ltd. The object of the demonstration is to show the reliability and cheapness of the a.c. motor. The electrical equipment shown includes squirrel cage, repulsion induction, variable speed and other a.c. motors, photo-electric cell equipment, and sound-amplifying and "talkie" apparatus.

Henley Soil-heating Cables

Messrs. W. T. Henley's Telegraph Works Co., Ltd., inform us that, owing to a typist's error, the lengths of soil-heating cables described in our last issue (page 776) were incorrectly given at 50 ft. This should have read 50 yds.

Proposed Hungarian Works in England

It is announced from Budapest that the Ver. Gluhlampen und Elektrizitäts A.G. of New Pesth is in negotiation with the Standard Elektrizitäts A.G. of New Pesth regarding the establishment of a joint works in England specially for working the patents held by the former company, covering radio apparatus, &c.

The British Industries Fair

European buyers are showing more interest in British goods than they have done for several years past. This fact is indicated by an announcement by the Department of Overseas Trade which lists twenty-two countries granting special travelling concessions to encourage attendance by their buyers at the next year's British Industries Fair, opening on February 19th. Railway administrations in these countries have agreed to offer reductions ranging from 10 per cent. to 33⅓ per cent. on return tickets to London and Birmingham in connection with the Fair. Shipping and air services are also offering substantial reductions.

A Useful Gift

The "Eclipse 4S" tools in a Christmas carton

A box of the "Eclipse 4S" tools is being packed in a special carton bearing the season's greetings in red; the makers, (Messrs. James Neill & Co. (Sheffield), Ltd.) suggest that the tools would make an excellent Christmas gift. A description of this useful little tool-kit appeared in our issue of September 30th, 1932. The special packing is illustrated.

Petters at the Smithfield Show

Among the exhibitors at the Smithfield Club Show, opened on Monday last at the Royal Agricultural Hall, Islington, N., are Messrs. Petters, Ltd., who are showing a varied selection of their products. These include 5 and 8-b.h.p. Atomic Diesel engines, new floating battery-type automatic electric lighting sets of 1 and 2 kW for country houses, &c., and a new one-ton auto-truck.

A Hackbridge Transformer Film

The film depicting the manufacture and transport of the largest transformers in the world, made by the Hackbridge Electric Construction Co., Ltd., which was introduced recently at Bush House, London, will be shown on December 13th at the Church of England Institute, Hood Street, Newcastle-on-Tyne, commencing at 7 p.m. Early in the New Year the film will be shown at other main centres.

New Catalogues and Lists

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, W.C.—Publications Nos. T.962, H.C.953, H.C.955, H.C.965, and C.L.960, dealing with the multi-circuit tungar charger, suggestions for electrical Christmas gifts, the "Butonook" electric iron, the "Drake" inset fire, and commercial lighting fittings.

Burgess Products Co., Barwell, Leicester.—Leaflets dealing with the "Snaplite" and "Keelite" flashlamps.

Premier Electric Heaters, Ltd., Keeley Street, Birmingham.—The 1933/34 catalogue of "Premier" electric heating appliances. Fully illustrated and priced.

Hotpoint Electric Appliance Co., Ltd., 24, Newman Street, W.—A folder illustrating some "Hotpoint" domestic appliances suitable for Christmas presents.

Cellactite & British Uralite, Ltd., 295-302, High Holborn, W.C.—A catalogue describing Cellactite "Medway" ventilators.

Samuel Fox & Co., Ltd., Stocksbridge, near Sheffield.—A quick-reference indicator for structural alloy steels.

Whessoe Foundry & Engineering Co., Ltd., Darlington, Co. Durham.—A broadsheet relating to "Whessoe" weighbridges, with illustrations of installations carried out by the company.

Walker Bros., Quality House, Temple Row, Birmingham.—The Christmas number of the "Electrical News," illustrating electrical gifts for the home.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.—A leaflet advertising the company's cables and wires.

Heyes & Co., Ltd., Water-Heyes Electrical Works, Wigan.—The November issue of the "Wigan Review."

Igranic Electric Co., Ltd., 149, Queen Victoria Street, E.C.4.—Leaflet No. 450, containing illustrated particulars of accessories for use with "Igranic" electric controlling devices.

F. W. Male & Son, Ltd., Falcon Works, Cartwright Street, Wolverhampton.—An illustrated catalogue of ironwork for overhead line equipment.

R. F. Winder, Ltd., Belgrave Electrical Works, Leeds.—A comprehensive price list of new and second-hand electrical material.

Macready's Metal Co., Ltd., Baron Street, N.—A card illustrating "Usaspead" forged steel blanks.

C.C.A. (Central Cables & Accessories, Ltd.), 101, Bunhill Row, E.C.—A folder illustrating switchplugs, junction boxes, cordgrips, &c., made by Electrical Appliances (Blackpool), for which the company is the sole London and Southern Counties agent.

Bell Fireplace Co., Kingswell Works, Northampton.—An illustrated folder containing details of a new inset electric fire recently placed on the market.

The Jointless Firebrick Co., Ltd.—In the notice relating to this company's observation ports for furnaces in our last issue, the registered trade mark was incorrectly spelt. It should have been "Plibrico."

The Skefko Ball Bearing Co., Ltd., Luton.—A price list of taper roller bearings.

Bankruptcy Proceedings

C. E. Moore, trading as C. E. Moore & Co., 35, High Street, St. Neots, Hunts, wireless engineer.—The adjourned examination herein was held at the Law Courts, Peterborough, recently. The previous hearing had been adjourned to allow debtor to file a goods account. The statement of affairs showed gross liabilities of £2,731, of which £1,695 was expected to rank for dividend. The net assets were £647, and there was an estimated deficiency of £1,049. The examination was concluded, subject to the signing of the notes.

H. Baxter, electrician, "Breachwood," Ball Green, Norton, Staffs.—Receiving order made November 24th on a creditor's petition.

S. Colbert, electrician and wireless dealer, 350, Kirkstall Road, Leeds.—Receiving order made November 24th on debtor's own petition.

F. W. Chattaway and **J. A. London** (Spa Electric & Radio Co.), electrical and radio engineers, 1, Church Walk, Leamington Spa.—Public examination January 24th at the Shire Hall, Warwick.

J. N. Davenport, electrical engineer and contractor, 35, Hilltop Avenue, Cheadle Hulme, Cheshire.—Discharged as from November 20th, 1933.

J. Mellanby, electrical engineer, Mystery House, Cambridge Road, Waterbeach, Cambs.—Last day for receiving proofs for dividend December 12th. Trustee, Mr. J. L. Wilkinson, 41, Sidney Street, Cambridge, Official Receiver.

E. Brown (World's Wireless Stores), wireless dealer, 70, Morton Gardens, Wallington, and at Croydon.—Discharge suspended for one year until October 26th, 1934.

L. E. Holland, electrician, 4, St. James' Churchyard, Haymarket, Bristol.—Trustee, Mr. J. D. Turner, 26, Baldwin Street, Bristol, Official Receiver, released November 10th.

T. S. Moore, electrical engineer, 29, Myrtle Street, Liverpool.—Trustee, Mr. J. Allcorn, Government Buildings, Victoria Street, Liverpool, Official Receiver, released November 14th.

F. O. Tosswill, electrical engineer, 60, Wodeland Avenue, Guildford.—Last day for receiving proofs for dividend December 15th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.

H. H. Bucklar, electrical engineer, 3, The Arcade, Hitchin.—Second and final dividend of 3½d. in the £, payable December 11th at 11, George Street West, Luton.

Company Liquidations

Nox Electric Lamp Co., Ltd.—Particulars of claims by December 16th to the liquidator, Mr. L. J. Coates, 2, East Parade, Leeds.

Yeoly Electrical Supplies, Ltd.—Meetings at Balfour House, Finsbury Pavement, E.C., on December 28th to receive an account of the winding-up by the liquidator, Mr. W. A. J. Osborne.

Haslam & Stretton, Ltd.—Meetings January 2nd at Baltic House, Mountstewart Square, Cardiff, to receive an account of the winding-up by the liquidator, Mr. G. T. Needham.

Southern Electric Co., Ltd.—Winding up voluntarily with a view to amalgamation with Messrs. Bryce, Ltd. Liquidator, Mr. W. B. Dewell, 9, Ironmonger Lane, E.C.

Rugby Electrical Engineering Co., Ltd.—Particulars of claims by December 30th to the joint liquidators, Messrs. G. H. Scott and A. Cripwell, 15, Market Place, Rugby.

Hewelectric Co., Ltd.—Meetings January 2nd at 82, Victoria Street, S.W., to receive an account of the winding-up by the liquidator, Mr. G. Dickinson.

Central Wholesale Electrical Co., Ltd.—Meeting January 1st at Eldon Street House, Eldon Street, E.C., to receive an account of the winding-up by the liquidator, Mr. J. J. Baker.

Electricity Supply

Lighting, Domestic, Power

Beetham.—ELECTRICITY SUPPLY.—Mr. J. Mashashall, representing the Westmorland Electricity Supply Co., Ltd., attended a meeting of the Parish Council recently and gave details of the route for cables to be laid in the parish. He said that it was hoped to have a supply available in a few weeks, and that there would be an extension to Hale.

Bridlington.—REVISED TARIFFS.—The Town Council has fixed the scale of charges for power and heating as follows: Up to 100 kWh per quarter, 3d. per kWh; 100 to 500, 2d.; 500 to 1,000, 1½d.; beyond, 1d.

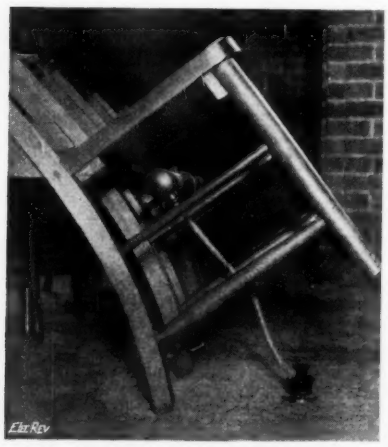
FLOODLIGHTING SCHEME.—The Town Council has decided, as a Christmas attraction, to floodlight the seafronts and gardens, as well as the public buildings of the town.

Clitheroe.—OVERHEAD EXTENSIONS.—Permission has been granted to the Corporation to erect overhead wires from Chatburn to Rimington, *via* Downham and Twiston, and from Hurst Green to Crossgills and Fairfield.

Darlington.—REDUCTION IN CHARGES.—Alterations in the system of charging for electricity consumed by private houses have been agreed upon by the Corporation Electricity Committee. It is proposed to make a fixed charge per quarter, depending upon the number of assessable rooms in the house, plus ½d. per kWh. In addition, the Committee proposes to reduce the service charge from 2s. 3d. to 2s. per quarter, and the rate for all electricity supplied during the quarter ending December by 20 per cent.

Devon.—VILLAGES SUPPLIED WITH ELECTRICITY.—The villages of Stoke Canon, Broadclyst and Newton St. Cyres have been supplied with electricity, and Upton Pyne and Brampford Speke will soon be added to the list.

The St. Thomas Rural District Council has approved of schemes submitted by the East Devon Electricity Co. for a h.p. and l.p. distribution system at Ting Tong, East Budleigh, Woodbury and Aylesbeare.



Tubular heaters are installed under the chairs in St. Wilfred's Church, Brighton; the picture shows the method of connection. **(See note on page 824)**

Durham.—COLLIERY CONVERSION.—The Pelton Fell Colliery, which is owned by the Mid-Durham Coal Carbonisation Co., is to restart after being idle for eight months. During the interval the machinery has been changed over from steam to electric drive.

Dyke (Lincs).—SUPPLY SOON.—The Mid-Lincs Electric Supply Co., is taking steps to give a supply of electricity to the parish as soon as possible.

Eastbourne.—LOAN SANCTIONED.—The Electricity Committee has received sanction to borrow £25,000 for mains and services.

East Ham.—LOANS APPROVED.—The Electricity Committee has received sanction to borrow £50,000 for electricity rental schemes and £2,990 for extension of mains and supply of mains equipment. Sanction has also been obtained to a loan of £2,672 for the installation of a new system of fire alarm call points in the borough.

Eccles.—DISCOUNT FOR LARGE CONSUMERS.—The Electricity Committee has decided that, as a temporary measure, a further discount of five per cent. shall be allowed upon the annual accounts to those consumers having a minimum consumption of 500,000 kWh per annum.

EXTENSION.—The Electricity Committee is to extend mains and erect a sub-station to provide a supply in the Winton area at a cost of £1,747.

LOAN SANCTIONED.—The Committee has obtained sanction to borrow £10,000 for mains extensions.

Gartmore (Stirlingshire).—ELECTRICITY SUPPLY INAUGURATED.—A supply of electricity has been commenced to Gartmore from the Grampian scheme.

Glasgow.—ELECTRICITY FOR COUNCIL HOUSES.—The Housing Committee is to consider a request from the Newbank and District Tenants' Association for the installation of electricity in all the Council houses.

Heston and Isleworth.—REDUCED CHARGES.—The Town Council has agreed to the following recommendations by its Electricity Committee: That, following the submission of the accounts for the March, 1934, quarter, the "telephone" system of charges be replaced by a two-part tariff consisting of: (1) A fixed charge computed at 7½ per cent. of the rateable value of the dwelling house; (2) a "unit" charge of 1d. in respect of 200 kWh consumed per quarter and thereafter a "unit" charge of ¾d., subject in the case of a quarterly consumption of 400 kWh or over to all such amounts being charged at ¾d. per kWh. That the tariff is reviewed at the expiration of six months from its inception. That on the termination of existing "telephone system" agreements for supply, consumers using electricity for lighting only be charged upon the flat rate of 5d. per kWh. That as from January 1st, 1934, the present quarterly meter rents of 2s. 1d. and 2s. 8d. be reduced to 2s. and 2s. 6d. respectively.

Hitchin.—NEW MAINS.—Mains extensions are to be undertaken at a cost of £1,946.

Iceland.—HYDRO-ELECTRIC WORKS.—It is reported from Reykjavik that the Icelandic authorities expect to receive by the new year a report and recommendations from the two Norwegian engineers, Messrs. Berdal and Nissen, who were called in to make a final estimate concerning the utilisation of the Sog waterfalls for the production of electrical energy. The Icelandic Parliament (Alting) has already promised a guarantee of 7,000,000 kr. for the transmission of energy to Reykjavik. The proposed hydro-electric works is estimated to involve an expenditure of 4,000,000 kr.

Ilford.—GASEOUS DISCHARGE LIGHTING.—The recently completed installation of "Mazda Mercra" lighting in Romford Road, Ilford, shows that there is no serious objection to the colour of gaseous discharge lamps in ordinary suburban thoroughfares, as distinguished from arterial roads, where most of the previous installations have been made and where the spectrum is not important. The Ilford installation falls into two sections; the first is the open space at Seven Kings' Station, and the second the stretch of the Romford Road, about a quarter of a mile in length, east of the station. Previously, difficulty had been experienced in lighting the area outside Seven Kings' Station satisfactorily owing to the great width of the road and the disposition of the tramway standards on which the units are mounted. The use of four "Mazda Mercra" lamps, in B.T.-H. circular lanterns (C.I.R. type), giving a wide dispersion of light, has solved the problem without changing the position of the units, though better results could have been obtained had it been possible to alter the position of the lighting units. This fitting has been designed for the lighting of open spaces, such as railway yards, docks, car parks, &c., where a good spread of well-diffused illumination is required. Essentially, the fitting consists of an over-reflector and a cylindrical opal glass, suitably ventilated. The Romford Road section is lighted by thirteen units in B.T.-H. directional lanterns (D.I.R. type) attached to tramway posts. The lanterns are spaced on alternate sides of the road, approximately 120 ft. apart, at a height of 20 ft. The directional lantern is made in several patterns according to the light distribution required. The pattern used in the present instance gives equal illumination up and down the road, but a greater intensity across the road than on the pavement. A series of foot-candle tests between posts has shown that, although the mounting height is much too low, the illumination is uniform. Mr. G. F. Gregory, the Ilford borough electrical engineer, was responsible for the initiation of these schemes.

India.—KURSEONG.—Our Bombay correspondent reports that the supply of electricity to Kurseong and neighbouring places in the Bengal Presidency by the Kurseong Electric Supply Co. was inaugurated recently. Electricity is generated by two 200-kW alternators working on the three-phase, 50-cycle system at a pressure of 3,300 V. The water for driving the turbines is obtained principally from the Rinchington and Sanyasi Rivers. The company has a contract with the Kurseong municipality for street lighting and other uses. Electricity will be distributed to consumers on the four-wire system at a pressure of 230 V for lighting purposes and at 400 V for power.

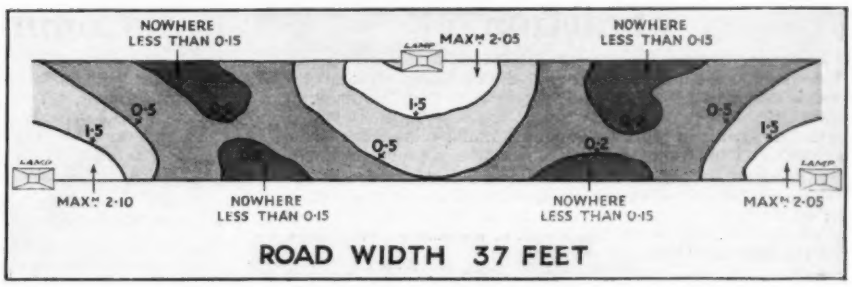
Irish Free State.—KILKENNY.—The Corporation has given the contract for the public lighting of the city to the Electricity Supply Board at £800 a year.

SUPPLEMENTING THE SHANNON SCHEME.—To cope with the increasing demand for electricity the Electricity Supply Board has decided to install additional generating plant at the Pigeon House Fort power station, Dublin. An additional turbine has been installed at Ardnacrusha, and it is estimated that this generation will increase the output of the scheme by 25 per cent., but it has not yet been found possible to put the turbine into operation.

Kingston.—NEW STREET LIGHTING.—On Friday evening last week a new street lighting installation along the Richmond Road in Kingston-upon-Thames was inaugurated. The width of the road is approximately 35 ft. and the newly lighted portion is about 1,000 yards long, and twenty G.E.C. "Osira" standards, spaced at from 145 to 165 ft., have been installed. Sir Alfred Woodgate, Mayor, pointed out that it was merely the beginning of street lighting developments in Kingston. The clear definition of objects on the road at a considerable distance which was a feature of this lighting was remarkable. On the Watford Road at Wembley there had not been a single road accident for over a year since this type of lighting had been used. Mr. Frank Hodges, who performed the switching

on ceremony, commented on and commended the G.E.C.'s extended research work in general and in particular on its efforts to improve illumination. He would like to see every arterial road so lighted that every head lamp of any motor car could be switched off. A picture of the new lighting appears on page 815.

INSTITUTION LIGHTING.—The Surrey County Council has sanctioned an expenditure of £1,471 for the installation of electric lighting at the Kingston-on-Thames and District Hospital and Institution.



An iso-foot-candle diagram showing the distribution of light on one unit of a system comprising three posts each equipped with a "Mercra" lamp in a B.T.-H. directional lantern

Long Eaton.—CHEAPER ELECTRICITY.—A reduction in charges amounting to £2,000 in a year has been announced by the Urban District Council. The price of lighting is reduced from 5d. per kWh for the first 750 kWh to 4½d. per kWh for the first 1,000 kWh, and a minimum of 3d. per kWh for all over 3,000 kWh per quarter. The charges for power are reduced from 1¾d. to 1½d. per kWh for the first 1,000 kWh per quarter. Heating and cooking charges are reduced from 1½d. to 1d. per kWh.

Midhurst.—OVERHEAD LINES.—The Mid-Southern Utility Co. has informed the Rural District Council of its intention to erect overhead lines through Rogate to Dangstein and across Terwick Common. The Council has requested the company to lay underground mains in Rogate Village.

Northern Ireland.—ELECTRICITY SUPPLY BOARD.—In the development of its supply scheme, the Northern Ireland Electricity Board intends to continue the main transmission line from Dungannon to Omagh to cover the principal areas of County Tyrone. The new line will run through Pomeroy, Carrickmore, Sixmilecross and Beragh, and will carry a voltage of 33,000. The Omagh Rural District Council has consented to the scheme.

COOKSTOWN.—The Cookstown Gas & Electric Power Co.'s power station has been acquired by the Northern Ireland Electricity Board, which will take it over on March 31st.

Parton.—PUBLIC LIGHTING.—A parish meeting has accepted the scheme of the Mid-Cumberland Electricity Co., Ltd., for public lighting on a twenty years' contract, and the supply will commence in four or five months' time.

Poland.—ELECTRICITY SUPPLY UNDERTAKINGS.—According to the *Polska Gospodarcza*, there are now twenty-two electricity generating and supply undertakings in Poland, with a total capital of approximately £6,375,600, of which 75.5 per cent. represents foreign investments in the country. Of this sum, Belgium has been responsible for about £1,990,000, Germany for £1,695,000, France for £583,000, Switzerland for £274,600, and Great Britain for £210,170.

Ramsgate.—REDUCED CHARGES.—Following the reduction of the charge for lighting from 7¼d. to 7d. per kWh, and for power from 4d. to 3d. per kWh, the Ramsgate & District Electric Supply Co., Ltd., has reduced the "unit" rate under the residential two-part tariff to 1d.

Ripon.—SHOP-WINDOW LIGHTING.—The Electricity Committee has received a petition from various traders suggesting that shopkeepers be allowed to use electricity at 3d. per kWh during the shopping period before Christmas, and it was decided to accede to the request on the understanding that the period be from December 6th to 20th, inclusive, and that the full lighting of the shop windows and all outside lights be continued until 9 p.m. on all days except Sunday. Display lamps for special illumination will be hired out to traders for the period.

St. Austell.—APPLICATION FOR LOWER CHARGE.—The Rural District Council has asked the St. Austell Electric Light Co. to reduce the charge for electricity from 10d. to 8d. per kWh.

Scarborough.—SALE OF UNDERTAKING.—A recent offer for the purchase of the Corporation electricity undertaking has again been considered. The Electricity Committee recommends that the Central Electricity Board's manager for North-East England be informed that the town is prepared to consider an official offer from the Board on terms and conditions indicated in the report.

Scottish Highlands.—SUPPLY WANTED.—The villages of Burghead, Hopeman and Cumingston, which are dependent upon oil for illumination, have approached the Grampian Electricity Supply Co. with a view to their inclusion in the Highland lighting scheme, which, at present, does not touch the Morayshire coast.

Seaham Harbour.—ASSISTED-WIRING SCHEME.—The Urban District Council has instructed the engineer to prepare a scheme for the provision of wiring installations on the hire-purchase basis.

REFRIGERATION TARIFF.—The Electricity Committee recommends that, for an experimental period of twelve months, a refrigeration tariff be instituted, comprising a standing charge of £4 3s. 4d. per annum (equal to 500 kWh at 2d.), all energy in excess of 500 kWh being charged at 1½d. per kWh, plus meter rent, no discount being allowed.

South Shields.—EXTENSION.—The Town Council is recommended to extend its power main by 1,950 yds., at a cost of £1,800, to Messrs. L. Wright & Son's factory at Tyne Dock, on condition that the firm enters into an agreement that it will receive and pay for energy for five years.

Stoke-on-Trent.—LOWER LIGHTING CHARGES.—The Electricity Committee has decided to reduce the charge for long-hour lighting of commercial and industrial premises.

CHANGE-OVER DEFERRED.—The Committee has deferred consideration of the proposal to change over the system of supply at Tunstall.

NEW TRANSFORMERS.—The Committee has decided to install additional transformers at Empson Street sub-station, Hanley, at a cost of £500, at Stoke Road station, Hanley (£500), and at Mintons' sub-station (£450).

LOAN SANCTIONED.—Sanction has been received to the borrowing of £3,800 for works in connection with the provision of a supply of electricity to Goldenhill.

Swansea.—LINK WITH THE GRID.—The town was connected to the grid system experimentally for the first time last Sunday, through Cardiff *via* the new transformer station at Tir John North.

The Romford Road, Ilford, illuminated by means of "Mazda Mercra" lamps. (See note on opposite page)

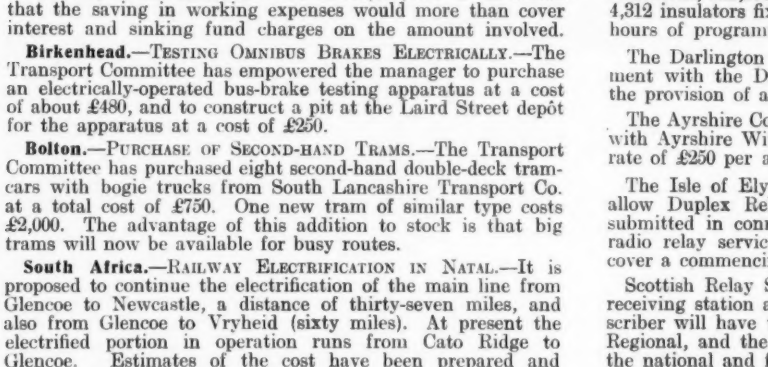
Traction

Australia.—SYDNEY-NEWCASTLE RAILWAY ELECTRIFICATION.—A departmental committee has reported favourably on the proposed electrification of the railway system from Hornsby to Newcastle, at an estimated cost of £1,500,000. It is stated that the saving in working expenses would more than cover interest and sinking fund charges on the amount involved.

Birkenhead.—TESTING OMNIBUS BRAKES ELECTRICALLY.—The Transport Committee has empowered the manager to purchase an electrically-operated bus-brake testing apparatus at a cost of about £480, and to construct a pit at the Laird Street depôt for the apparatus at a cost of £250.

Bolton.—PURCHASE OF SECOND-HAND TRAMS.—The Transport Committee has purchased eight second-hand double-deck tramcars with bogie trucks from South Lancashire Transport Co. at a total cost of £750. One new tram of similar type costs £2,000. The advantage of this addition to stock is that big trams will now be available for busy routes.

South Africa.—RAILWAY ELECTRIFICATION IN NATAL.—It is proposed to continue the electrification of the main line from Glencoe to Newcastle, a distance of thirty-seven miles, and also from Glencoe to Vryheid (sixty miles). At present the electrified portion in operation runs from Cato Ridge to Glencoe. Estimates of the cost have been prepared and amount to about £300,000. With sidings, there will be a total of 115 track miles.



Colour-light signalling has been installed at Thirsk, Yorks. The left-hand picture shows some of the equipment and the signal box. On the right is a view of the interior of the box

Southern Railway.—FURTHER ELECTRIFICATION.—Another extensive electrification scheme has been announced by the Southern Railway. It is proposed to provide electric services to Hastings *via* Haywards Heath, Lewes, Eastbourne, and Bexhill. The line between Brighton and Lewes and Seaford and Lewes will also be electrified, and the whole scheme, affecting twenty-eight stations, will cost about £1,750,000 and be completed early in 1935. The project will add another sixty route miles of electrified line to the present total of 382 miles, and will increase the train mileage by 45 per cent., the proposed schedule being as follows: London and Hastings (*via* Eastbourne) express, one train an hour (supplemented during business periods); semi-fast, four trains a day. Horsted Keynes, Lewes and Seaford, one train an hour. Brighton and Hastings (*via* Eastbourne), two trains an hour. Brighton and Seaford, two trains an hour. There will be a link with Horsted Keynes and Haywards Heath *via* Ardingly. Forty new car units are to be constructed, including seventeen Pullman trains. Longer trains will be used and will necessitate the lengthening of platforms at London Bridge, Lewes, and Eastbourne, and alterations to the permanent way at Bexhill Central.

Spain.—NEW ELECTRIC LOCOMOTIVES.—Four 1,000-h.p. electric locomotives have recently been completed for use on the Bilbao-San Sebastian section of the Vascongadas metre-gauge railway, a line which traverses the slopes of the Pyrenees and is characterised by sharp curves, steep inclines, and numerous tunnels. The equipment is mounted on two four-wheel bogies, each axle of which is separately driven by a 250-h.p., 750-1,500-V d.c. motor. The wheels, which are 39 in. in diameter, are driven through five-to-one reduction gearing, the speed of the motors, at a one-hour rating, being 1,100 r.p.m. The electrical plant for the four engines was built by the Swedish General Electric Co., while the mechanical part was constructed in Spain.

Traffic Signals.—The Ealing Corporation is to provide traffic signals in Uxbridge Road at a cost of £584, and the Southgate Corporation is to install traffic-actuated signals at a cost of £307. Vehicle-actuated traffic signals costing £556 are to be provided in Wembley by the Urban District Council.

Traffic signals are to be installed in London at the crossing between Vauxhall Bridge Road and Rochester Row, Buckingham Palace Road at the Ecclestone Road bridge intersection, and the crossing of South Audley Street and Deanery Street.

Communications

Great Britain.—RADIO RELAY SERVICES.—During the six months that "Radiomains," Kettering's wireless relay system, has been operated, 417 homes and public buildings have been connected, 103,500 yards of wire erected, 1,078 brackets fixed, 4,312 insulators fixed, two-thirds of the town wired, and 2,350 hours of programmes given.

The Darlington Town Council has entered into an arrangement with the Darlington Wireless Relay Service, Ltd., for the provision of a relay service.

The Ayrshire County Council has entered into an agreement with Ayrshire Wireless Services, Ltd., who are to pay at the rate of £250 per annum for every 1,000 subscribers.

The Isle of Ely C.C. Highways Committee has refused to allow Duplex Relay, Ltd., to amend the draft agreement submitted in connection with the proposed establishment of radio relay services at Chatteris and Littleport in order to cover a commencing period of ten years.

Scottish Relay Services (Kilmarnock), Ltd., have opened a receiving station and a relay house in Kilmarnock. The subscriber will have the choice of two programmes, the Scottish Regional, and the other containing a selection of items from the national and foreign stations. The service is to be available continuously from early morning till midnight, or later for special broadcasts.

Cheltenham Highways Committee has refused to grant an application by the Universal Wireless Relay Service for permission to establish a relay service in the town.

York Highways Committee recommends consenting to the assignment of their wireless relay services by Messrs. Flowitt & Netherwood to a public company which is being formed.

The Northampton Wireless Relay Co. has commenced its service and is supplying dual programmes to about fifty subscribers.

Hungary.—NEW BUDAPEST STATION OPENED.—The new 120-kW station at Lakihegy, Budapest, was opened last Saturday. It possesses the world's highest wireless aerial, the cigar-shaped mast being 314 metres high. The station is built on the 100 per cent. spare system, *i.e.*, everything is duplicated—even the crystal oscillator—in readiness for emergencies and in the last stage, four 120-kW valves are used in push-pull. An interesting novelty is the provision of a switch which, in case of emergency, will cut out all current supply, closing down the station in a fraction of a second.—*Wireless World*.

India.—CHEAPER CALLS FROM BRITAIN.—On Saturdays the price of calls from Great Britain to India is to be £1 per minute, with a minimum of £3, which is half the normal rate.

Poland.—NEW WIRELESS STATION.—A new short-wave broadcasting station with a power of about 2 kW is to be built in Warsaw. It will be the first short-wave broadcasting station in Poland to broadcast regularly.—*Reuter* (Warsaw).

South Africa.—NEW HIGH-POWER STATION.—The institution of a South African "Rugby" wireless station is being mooted for South Africa. A powerful wireless station capable of direct communication with the whole of the Union and overseas stations is to be erected at Defence Headquarters, Roberts Heights, according to a Government announcement made on November 28th. Should the demand for such a service exist, the Government will use the station for the transmission and reception of broadcast news on the lines of the Rugby service. A chain of wireless stations equipped with direction finders for the assistance of aviation is also to be constructed throughout the Union and South-West Africa. The Government has reiterated its intention of maintaining the wireless monopoly.—*Reuter* (Pretoria).

Sweden.—RECONSTRUCTION OF THE MOTALA STATION.—The Telegraph Board is asking permission of the Government to use Kr. 1,400,000 of its renewal fund for the reconstruction of the Motala broadcasting station, the largest in Sweden, which is now of 30-kW capacity, but will have its power raised to 150 kW.—*Reuter's Trade Service* (Stockholm).

Switzerland.—BERNE.—The Bureau Internationale de l'Union Télégraphique, Berne, informs us that from January onwards its name will be the Bureau de l'Union Internationale des Télécommunications.

Tasmania.—TELEPHONE ESTIMATES.—It is expected that in next year's estimates a sum of about £150,000 will be made available for the provision of a telephone service across Bass Straits, connecting Tasmania with the mainland, states the *Australasian Electrical Times*.

Turkey.—RÁDIO STATIONS.—The Standard Elektrizitäts A.G. of Budapest is reported to be in negotiation with the Turkish postal authorities with regard to the construction of various radio stations in Turkey.

Contract Information

When "Contracts Open" are advertised in our "Official Notice" pages the date of the "Electrical Review" containing the advertisement is given in parentheses below

Contracts Open

Australia.—MELBOURNE.—Post and Telegraph Department. January 2nd. Telephone switchboard lamps and sockets. (A.Y. 12053.)* Telephone jacks and number plates. (A.Y. 12066.)*

January 9th. Hand-operated telephone generators. (A.Y. 12064.)* Bells and buzzers. (A.Y. 12065.)*

January 16th. Telephone timing clocks. (A.Y. 12085.)* Telephone switchboard keys and accessories. (A.Y. 12081.)* Resistances and reactances. (A.Y. 12083.)*

January 23rd. Telephone trunk test boards. (A.Y. 12091.)*

State Electricity Commission of Victoria. January 8th. Five automatic induction voltage regulators. (A.Y. 12071.)* 115-kW a.c. motor. (A.Y. 12053.)*

January 15th. Triple-braided copper conductor. (A.Y. 12054.)*

BRISBANE.—January 31st. City Electric Light Co., Ltd. Land and submarine cable. (A.Y. 12072.)*

February 7th. 44-kV switchgear. (A.Y. 12092.)*

Caithness.—December 21st. County Council. Various works, including electric lighting at new school building, Thurso. Schedules from Messrs. Sinclair, Macdonald & Son, architects, Wick and Thurso (deposit 2 guineas); tenders to Mr. D. W. Georgeson, clerk to the Education Committee, Wick.

Clackmannan.—County Education Committee. Electrical installation at new school in Alloa. Schedules (£2 2s.) from J. Melvin & Sons, Mar Street, Alloa.

Cowdenbeath (FIFE).—December 20th. Town Council. Various works, including electrical, at eighty houses. Specifications, &c., from Mr. C. A. Alexander, burgh surveyor, Town House, Cowdenbeath (£2 2s.); tenders to Town Clerk.

Dover.—December 13th. Corporation. Rewinding motors and other electrical apparatus in connection with the change of frequency. (December 1st.)

Egypt.—ALEXANDRIA.—February 26th. Ministry of Communications. Cable, switchgear, transformers, hauling winches and motors. (A.Y. 12094.)*

Fife.—December 12th. County Council. Various works, including electrical installation, at alterations and additions to St. Margaret's R.C. School, Dunfermline. Schedules (deposit £1 1s.) from Mr. G. Sandilands, Education Offices, Wemyssfield, Kirkcaldy; offers to Mr. J. M. Mitchell, county clerk, County Buildings, Cupar.

India.—NEW DELHI.—Indian Stores Department. January 8th. A.c. and d.c. table fans. (A.Y. 11967.)*

Knaresborough.—December 30th. Electrical engineering work at Scotton Banks Sanatorium, West Riding Architect, County Hall, Wakefield.

London.—ISLINGTON.—January 17th. Borough Council. Electrical and engineers' stores for one year commencing April 1st, 1934. (See this issue.)

Morocco.—CASABLANCA.—December 19th. Municipality. 18,300 electric lamps. (A.Y. 12097.)*

New Mills.—December 8th. Electricity Department. E.h.p. cable, equipment and labour for mains extensions. (December 1st.)

New Zealand.—WELLINGTON.—Posts and Telegraph Department. January 8th. Microtelephone cradles. (A.Y. 12046.)* Telephone jacks. (A.Y. 12045.)*

January 9th. A 100-Ah secondary battery with 60 cells. (A.Y. 12047.)*

January 16th. Thirty-five miles of v.i.r. wire. (A.Y. 12086.)*

January 17th. Forty miles of flameproof telephone jumper wire. (A.Y. 12088.)*

January 30th. 300 Planté positive battery plates. (A.Y. 12104.)* Two hot-cathode type rectifiers. (A.Y. 12106.)* Twenty 180 ohm resistance spools. (A.Y. 12105.)*.

January 31st. One stationary battery of twelve unburnt cells. (A.Y. 12107.)*

February 5th. Seventy-five tons of hard-drawn copper wire. (G.Y. 13208.)*

February 6th. 71,000 dry cells for telephone use. (A.Y. 12101.)*

February 13th. Twenty-four 0-8430 ohm rheostats. A.Y. 12103.)* Fifty miles of tinned copper v.i.r. wire. (A.Y. 12108.)*

January 16th. Public Works Department. Four 1,500-kVA transformers. (A.Y. 12017.)*

CHRISTCHURCH.—January 11th. City Council. Single-phase and three-phase power transformers. (A.Y. 12089.)*

Northern Ireland.—BELFAST.—December 15th. Corporation. Electric lighting installation at Lancaster Street School. Town Clerk (deposit £1 1s.).

December 18th. Wiring and connecting up existing electrical plant at refuse destructor works. Town Clerk.

Persia.—TEHERAN.—January 7th. Municipal Council. Boilers, turbo-alternator sets, switchboards, transformers and cables, in connection with a proposed power station. (A.Y. 12079.)*

Pontefract.—December 13th. West Riding Standing Joint Committee. Electric wiring at Upton Police Station. Tenders to J. C. McGrath, Clerk of the Peace, County Hall, Wakefield.

Portsmouth.—December 15th. Electricity Department. Eight 200-kVA and two 100-kVA three-phase transformers and two 500-kVA Scott-connected transformer groups. (December 1st.)

Sheffield.—December 14th. Electric lighting in farm buildings at Wadsley Mental Hospital. W. E. H. Burton, West Riding Mental Hospitals Board, Wakefield.

South Africa.—JOHANNESBURG.—January 15th. Railways and Harbours. Train lamps and fittings. (G.Y. 13163.)*

Swansea.—December 20th. Electricity Department. Boiler feed pumps, &c. (November 24th.)

Southend-on-Sea.—December 28th. Electricity Department. Transformer kiosks. (See this issue.)

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* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed

Barking.—Electricity Committee. Recommended. Switchgear for sewage works (£357).—A. Reyrolle & Co., Ltd. Cables for twelve months (£1,418).—Metropolitan Electric Cable & Construction Co., Ltd.

Birkenhead.—Electricity Committee. Accepted. Cable for assisted-wiring scheme.—Hackbridge Cable Co., Ltd. L.p. cables for twelve months.—Mersey Cable Works, Ltd. Transformers for twelve months.—General Electric Co., Ltd. Switchgear for twelve months.—English Electric Co., Ltd. Wiring houses under assisted scheme.—L. W. Bryan (38 houses, £176); Economic Electric Co. (25 houses, £115); S. George (36 houses, £154); J. McKenzie (4 houses, £15); Park Electrical Co. (43 houses, £195).

Dumbarton.—County Council. Accepted. Construction of an electrically operated swing bridge over the Forth and Clyde Canal at Old Kilpatrick.—Sir W. Arrol & Co., Ltd.

Durham.—County Education Committee. Accepted. Electrical work at schools.—L. Urwin (Hare Law); Sleigh & Wood (West Kyo); Robson & Coleman (Tanfield Burnopfield Leazes).

Eastbourne.—Electricity Committee. Recommended. Prepayment meters for ensuing year.—Aron Electricity Meter, Ltd. Ordinary type meters for ensuing year.—Metropolitan-Vickers Electrical Co., Ltd.

Eccles.—Electricity Committee. Accepted. Transformer kiosk and switchgear (£239).—Ferguson, Pailin, Ltd.

Friern Barnet.—Highways Committee. Accepted. Traffic signals at Orange Tree crossing (£449).—Automatic Electric Co., Ltd.

Glasgow.—Housing Committee. Accepted. Electrical installation at Knightswood housing extension (£451).—Dick-Cleland, Bennet & Co.

Police Committee. Accepted. Electric lighting at central mortuary (£354).—D. A. McLarty.

Transport Committee. Accepted. Subway electrification.—Signalling cable.—Craigpark Electric Cable Co., Ltd. Traction equipment and magnet coils.—Metropolitan-Vickers Electrical Co., Ltd. Switchboard panels.—British Thomson-Houston Co., Ltd.

London.—L.C.C.—Central Public Health Committee. Accepted. Installation of an automatic telephone system at St. Mary's Hospital, Islington (£1,333).—T. Clarke & Co., Ltd.

Public Assistance Committee. Recommended. Installation of automatic telephone system at Swaffield Road Institution (£523).—T. Clarke & Co., Ltd.

Maidenhead.—Town Council. Accepted. Steel kiosk type sub-station (£217).—W. Lucy & Co., Ltd.

Middlesex.—Health Committee. Recommended. Wiring work in connection with installation of electric cooking equipment at White Webbs Institution (£301).—T. Clarke & Co., Ltd. Accepted. Electrical installation at Hillingdon nurses' home extension (£727).—T. Clarke & Co., Ltd.

Highways Committee. Recommended. Automatic traffic signals at four road junctions.—Automatic Electric Co., Ltd.

Plymouth.—Mental Hospital Committee. Accepted. Automatic oil fuel equipment for two boilers to operate on new electricity supply (£152).—G. N. Haden & Sons, Ltd.

Salford.—Electricity Committee. Recommended. Switchgear (£287).—Ferguson, Pailin, Ltd.

Stoke-on-Trent.—Baths Committee. Accepted. Sun-ray apparatus at Hanley baths (£92).—Hewittic Electric Co., Ltd.

Stratford-on-Avon.—Rural District Council. Accepted. Wiring houses at Aspley Heath and Terry's End, Tanworth (£3 per house).—S. Davis, Ltd.

Surbiton.—Metropolitan Water Board. Accepted. Electric drilling machine for pumping station (£211).—F. Town & Sons.

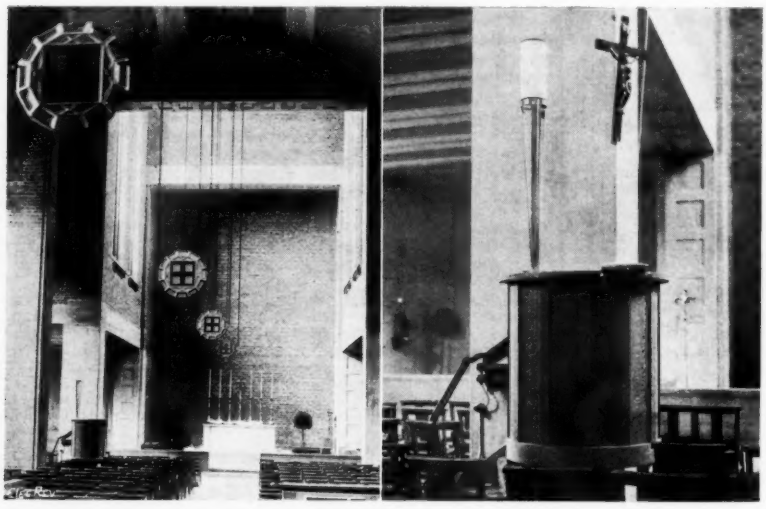
Forthcoming Events

Junior Institution of Engineers.—Friday, December 8th. Royal Society of Arts, Adelphi, W.C. Presidential address. "Newton's Third Law of Motion and some Dynamics." Mr. W. J. Tennant. Friday, December 15th. Institution, London. 7.30 p.m. "General Principles Governing Cable Network, Design and Maintenance in Large Towns." Mr. E. W. C. Day.

Association of Mining Electrical Engineers.—(*South Wales Branch*).—Saturday, December 9th. South Wales Institute of Engineers, Cardiff. 6 p.m. "Some Modern Applications of Coal and its Products." Dr. F. S. Sinnatt. (*West Wales Branch*).—Saturday, December 9th. Y.M.C.A., Swansea. "Electricity at and near Coal Face." Mr. F. E. Cope.

Institution of Electrical Engineers.—Monday, December 11th. Institution, London. 7 p.m. Informal meeting. Discussion on "Luminous-Gas Signs." Opened by Mr. J. Eck. (*London Students' Section*).—Friday, December 8th. Institution, London. 7 p.m. The Students' Lecture. "Engineering Problems

of the Grid." Mr. R. O. Kapp. Saturday, December 16th. 2.30 p.m. Visit to Messrs. Watney, Combe, Reid & Co., Ltd., Pimlico. (*North Eastern Students' Section*).—Friday, December 8th. Armstrong College, Newcastle-on-Tyne. 7 p.m.



The lighting of St. Wilfred's Church, Brighton. The right-hand picture shows one of the heating tubes

Debate on "That the extraordinary development of science has caused the present world depression." (*South Midland Students' Section*).—Friday, December 8th. Boots' Café, Birmingham. Annual dance. (*Scottish Centre*).—Tuesday, December 12th. North British Station Hotel, Edinburgh. 7 p.m. Discussion on "The Costing of Production at Selected Stations." Opened by Mr. N. C. Bridge. (*North Midland Students' Section*).—Tuesday, December 12th. Hotel Metropole, Leeds. 7.15 p.m. Problems night. (*Hampshire Sub-Centre*).—Wednesday, December 13th. Municipal College, Portsmouth. 7.30 p.m. "Luminous-Tube Lighting." Mr. C. C. Paterson. (*West Wales* (*Swansea*) *Sub-Centre*).—Thursday, December 14th. Electric House, Swansea. 6 p.m. "The Low-Voltage Sections of the British 'Grid' System." Mr. C. W. Marshall. (*Irish Centre*).—Thursday, December 14th. Trinity College, Dublin. 7.45 p.m. "The Development of Tuning Circuits in Wireless Receivers." Lt.-Col. K. E. Edgeworth. (*North-Eastern Centre*).—Friday, December 15th. Grand Assembly Rooms, Newcastle-on-Tyne. 7 for 7.30 p.m. Annual dinner and dance.

Illuminating Engineering Society.—Tuesday, December 12th. Lighting Service Bureau, W.C. 7 p.m. "An Analytical Basis for a Lighting Code, &c." Mr. A. W. Beuttell.

Television Society.—Wednesday, December 13th. University College, W.C. 7 p.m. "Electro-Optics in Television." Mr. L. M. Myers.

Edinburgh Electrical Society.—Wednesday, December 13th. Plaza. Annual dance.

Diesel Engine Users' Association.—Wednesday, December 13th. Caxton Hall, S.W. 4 p.m. Discussion on "Repairs to Oil Engine Parts by Welding."

Birmingham Electric Club.—Friday, December 15th. Grand Hotel, Birmingham. 7 p.m. Annual meeting.

Rugby Engineering Society.—Friday, December 15th. Co-operative Hall, Rugby. Reception and ball.

Notes

I.E.E. London Students

The dance given at the Imperial Hotel, W.C., by the London Students' Section of the Institution of Electrical Engineers on Tuesday was one more in the series of those well-organised and enjoyable functions that are now an important and (we trust) a permanent part of the Section's work. Mr. T. G. Martin, the hon. assistant secretary for entertainments, was in charge of the arrangements, which included a cabaret that was evidently greatly appreciated by upwards of 150 people who were present. Mr. F. Jervis Smith, chairman of the Section, supported by Mr. E. L. Hefferman, hon. secretary, acted as M.C. for the evening.

The Regal Cinema, Wimbledon

Excellent examples of decoration embodying appropriate lighting effects are to be seen at the recently opened Regal Cinema, Wimbledon (County Cinemas, Ltd.), and a good deal of electrical equipment has been installed under the supervision of Mr. Basil Davies, A.M.I.E.E. The electrical installation was carried out by Messrs. Drake & Gorham, Ltd., and among the suppliers of equipment were the General Electric Co., Ltd., F. H. Pride, Western Electric Co., Ltd. (sound equipment), Electrolux, Ltd. (refrigerators), and the Sturtevant Engineering Co., Ltd. (vacuum-cleaning plant). A view of the café of the cinema is reproduced herewith, and two pictures of the auditorium illustrating the lighting appear on page 813.

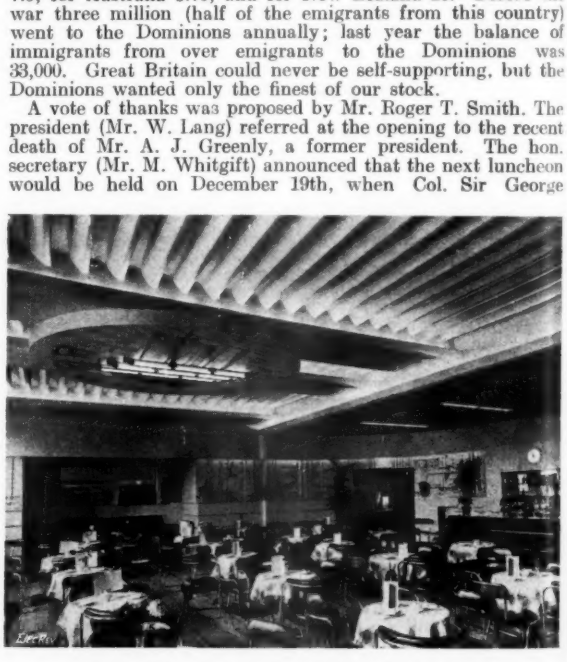
An Electrically Equipped Brighton Church

An excellent example of the use of electricity in a church is provided in the recently consecrated St. Wilfred's, Brighton. The whole installation has been carried out by Messrs. T. Clarke & Co., Ltd., in accordance with the specification prepared by Mr. William MacIntyre, the electrical engineer. The switchboard is of unusual size for church purposes, and controls about 100 kW of heating and lighting units. Electrical heating has been made possible by the granting of low terms by the Brighton Electricity Committee. The heating is so arranged that there can be no "cold" or unheated parts in the building. The units consist of 2-in. tubes with a loading of 60 W per foot run, and a total of 1,450 ft. is used. The tubes are fixed on the walls, in recesses, and under the rows of chairs, connected to the wires by floor plugs. The illumination is simple in appearance, but very effective. The main lighting comes from six 200-W lamps fixed in front of fibrous plaster plaques suspended from the roof and directing light towards the altar, while two 200-W floodlights illuminate the altar. The main lights can be operated by a dimmer as required.

Population and Prosperity

Sir John A. R. Marriott was the principal guest of the Batti-Wallahs' Society at its luncheon last week at the Hotel Metropole, W.C.1. The subject of his address was "Population and Prosperity," in which he drew attention to the mal-distribution of white population in the British Empire as an economic, political, and strategic danger. The population per cultivable square mile in Great Britain was 701; in Germany it was 348, in Italy 319, and France (which was almost self-supporting), 187. In the Dominions the corresponding figures, after deducting waste land, were for Canada 7.5, for Australia 3.75, and for New Zealand 16. Before the war three million (half of the emigrants from this country) went to the Dominions annually; last year the balance of immigrants from over emigrants to the Dominions was 33,000. Great Britain could never be self-supporting, but the Dominions wanted only the finest of our stock.

A vote of thanks was proposed by Mr. Roger T. Smith. The president (Mr. W. Lang) referred at the opening to the recent death of Mr. A. J. Greenly, a former president. The hon. secretary (Mr. M. Whitgift) announced that the next luncheon would be held on December 19th, when Col. Sir George Courthope, as the principal guest, would address the members on "Trees and Afforestation."



The café of the Regal Cinema, Wimbledon

Appointments Vacant

Meter tester and repairer for Southampton Electricity Department.

Assistant sales engineer for Bedford Electricity Department.

Executive engineer for the Punjab Public Works Department, Electricity Branch.

Electrical engineer in the Middlesex county architect's department.

Temporary draughtsman for Carlisle Electricity Department.

Chief electrical draughtsman for Wolverhampton Electricity Department.

(See our classified advertisements.)

Makers' Names Wanted

KOH-I-NOR and MUHOLOO hair clippers.

Our Personal Column

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements

Sir William Ray is to retire from the London County Council in March next as his duties as executive chairman of the British Electrical Development Association will make it impossible for him to give his time to Council work. His successor has been appointed this week.

Mr. J. A. England has resigned his post on the technical staff of the Wolverhampton Corporation Electricity Department to take up an executive position with Messrs. Erskine, Heap & Co., Ltd., Manchester. Mr. England commenced his career with the Edison Swan Electric Co. at its Ponders End works, where he received a comprehensive training, and in 1923 joined the North Metropolitan Electric Power Supply Co. After several years in the electricity supply industry, Mr. England returned to the manufacturing industry and served with several well-known concerns, including the Metropolitan-Vickers and the English Electric Companies. Whilst with the latter company Mr. England carried through several important switchgear contracts, and was latterly engaged upon special design. Early in 1931 he was appointed to his present position at Wolverhampton, and has been largely responsible, under Mr. T. A. G. Margary, the engineer and manager, for the technical work in connection with the e.h.p. switchgear reconstruction scheme which is being carried out by that undertaking. Mr. England takes up his new duties in the New Year.

Mr. J. A. England

Mr. Howard Foulds, secretary of Callender's Cable & Construction Co., Ltd., has been elected a vice-president of the Chartered Institute of Secretaries, after having served his period of office as treasurer.

Mr. G. Mitchell, who has retired after fifty-two years' service with the Portsmouth Corporation Tramways Department, has been presented with a case of pipes and a tobacco pouch. The presentation was made on November 28th by Mr. B. Hall, the general manager and engineer.

Mr. A. J. Fuller, electrical engineer to the Fulham Borough Council, who has been in ill-health for some time, has been granted three months' leave of absence by the Council on full pay. His medical advisers have recommended a long sea voyage. In addition to his duties as borough electrical engineer, Mr. Fuller has also acted as joint consulting engineer with Messrs. Preece, Cardew & Rider for the extension of the power station. During his absence the electricity undertaking will be in charge of the assistant borough electrical engineer.

Mr. S. E. Newman, A.M.I.E.E., chief assistant switchgear design engineer at the English Electric Co.'s Stafford works, was married, at St. Mary's Church, Stafford, on December 2nd, to Miss Constance Collier, also of Stafford.

Mr. H. D. Ellis, one of the authors of the I.E.E. paper on valve amplifier noise investigations dealt with on page 805

We are very pleased to learn as we go to Press that **Mr. J. S. Highfield,** who has been seriously ill, is making satisfactory progress towards recovery.

Mr. W. H. Hancock has been appointed borough electrical engineer to the Conway Corporation.

Mr. J. A. Hunn, M.I.E.E., M.I.Mar.E., who has been for many years the London manager of Laurence, Scott & Electromotors, Ltd., at Australia House, Strand, has been appointed a local director of the company and will continue to control the business of the London office.

Mr. J. B. Ashworth, sales engineer to the Farnworth Urban District Council, has been appointed consumers' engineer to the Blackburn Corporation Electricity Department, and **Mr. C. Brown,** at present in the Leeds office of Messrs. Merz & McLellan, has been appointed mains draughtsman.

Mr. F. V. Brook, eldest son of Mr. E. Brook, managing director of Brook Motors, Ltd., was appointed to the board during November last. Mr. F. Brook, who is twenty-five, has been with the company for over eight years, the first three of which were devoted to obtaining a thorough knowledge of the business, during which time he passed through every department. Afterwards he went to the Manchester branch as a salesman and was then transferred to the London Office. For the past three years he has been salesman in charge of Huddersfield and district, and during this period the turnover of this area has been more than doubled. Mr. Brook takes a keen interest in the social activities of the staff and has organised many of the functions.

Mr. F. V. Brook

Mr. A. Williams, M.I.E.E., has been appointed to represent, in London and the Eastern and Southern Counties, Messrs. J. G. Statter & Co., Ltd. He is also associated with Electrical & Engineering Products, Ltd., in its representation of the Foster Engineering Co., Ltd. His address is 16, Messaline Avenue, Acton, W.3. (Telephone: Acorn 2729.)

Mr. H. J. Macready, B.Sc., M.I.E.E., principal of the Engineering Department and chief assistant of Wolverton Technical College, has been appointed head of Londonderry Technical School.

Miss J. Freeman has been appointed by Bedford Town Council as lady demonstrator at the electricity showroom.

Mr. W. F. Jarvis, of Stafford, has been appointed showroom sales superintendent to the Bury Corporation Electricity Department.

Obituary

Mr. D. E. Batty.—The death occurred on December 2nd at the age of fifty-nine of Mr. Dudley E. Batty, A.M.I.E.E., M.I.A.E., electrical engineer to the Associated Equipment Co., Ltd., after a long illness. Mr. Batty had been associated with the A.E.C. since January, 1917, and was responsible for a great deal of the pioneer work in connection with the trolley-buses which the company is now manufacturing in conjunction with the English Electric Co., Ltd., and in connection with the heavy-oil engine which has recently been successfully introduced into the motor transport field.

Mr. L. W. Holmes.—Mr. Leonard William Holmes, whose death at Worthing on November 21st was mentioned in our last issue, was born at Newcastle-on-Tyne in 1859. He went to Australia, where he married Edith B. Harcus at Adelaide. Returning to this country about the year 1885, he joined his father and brothers in the firm of Messrs. J. H. Holmes & Co., electrical engineers, Newcastle-on-Tyne, and opened their London office, of which he was for many years the head. He was of a sanguine temperament and a first-rate salesman, with great persuasive powers, and soon built up a wide circle of friends and customers. Before there was any general distribution of electricity in London, he obtained orders for private installations, many of which are still at work, one of the earliest being that carried out in 1888 for Messrs. Maple & Co. in Tottenham Court Road. Mr. Leonard Holmes was very successful in making contracts for the electric lighting of public institutions, mills, factories, steamships and private yachts, all having their own electric generating plants. In 1897 he

The late Mr. L. W. Holmes

acquired for his firm the "Lundell" patents for electric motors which were at once applied to electric cabs and especially to printing machines, and we understand that it was through his efforts that the principal newspaper presses in London were converted from steam to electric drive. He had been a member of the Institution of Electrical Engineers since 1889. In 1908, following a serious illness, he retired from the firm of Messrs. J. H. Holmes & Co., and since that date he had taken little active part in the electrical industry. His wife and four married daughters survive him.

Mr. E. N. Hurley.—Mr. Edward N. Hurley, who, in 1907 organised the Hurley Machine Co. (now the Electric Household Utilities Corporation), one of the largest American manufacturers of home electrical equipment, died in Chicago on November 14th, aged sixty-nine years. The *Electrical World* says that at the time of his death he was serving as chairman of the Middle West Utilities Co., and as its co-receiver spent several weeks in England on matters affecting British investors in the Insull enterprises.

Mr. E. A. Davis.—The same contemporary reports that Mr. Edwin A. Davis, formerly vice-president and controller of the Middle West Utilities Co., committed suicide at his home in Los Angeles on November 7th; he was fifty-two years of age. He had for many years been connected with the public utility industry in the U.S.A., and had been prominently connected with the National Electric Light Association. He was a Canadian by birth.

Mr. T. F. Raven.—The death occurred on November 29th at Settle, at the age of fifty-six, of Mr. T. F. Raven, engineer and manager of the Settle & District Electricity Co., Ltd., after a brief illness. Mr. Raven was an articled pupil at Crompton & Co.'s Chelmsford works. He spent twelve years in India as the company's chief constructional engineer in connection with contracts carried out in Karachi, Lucknow, Allahabad, Nagpur and Ahmedabad. During the war he was Assistant Director of Military Works at Simla, rejoining Messrs. Crompton's after the war.

Mr. H. Middleditch.—The death took place on November 28th, at the age of seventy-six, of Mr. H. Middleditch, who was until his retirement a year or two ago head electrician at Arundel Castle to the Duke of Norfolk. He had charge of the entire plant at the castle since its installation.

Will.—Mr. T. J. Grainger, head of Messrs. T. J. Grainger & Co., Ltd., electrical factors, Newcastle-on-Tyne, left estate of the gross value of £20,919 (net personalty £14,788).

Financial Section

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Changes, Transactions in Stocks and Shares

New Companies Registered

W. E. Forster, Ltd.—Private company. Registered December 2nd. Capital, £100 in 5s. shares. Objects: To acquire the business of an electrical engineer and contractor, carried on by W. E. Forster, at 380a, Wimborne Road, Bournemouth, and to carry on the business of wireless, electrical and general engineers, &c. The first directors are: Mrs. Marian Forster and W. E. Forster, both of 12, Pickford Road, Bournemouth.

L. Jones (Burslem), Ltd.—Private company. Registered December 2nd. Capital, £1,500 in £1 shares. Objects: To acquire the business of a wholesale, general factor and agent and radio specialist and electrical engineer, and dealer in electrical appliances, fittings and accessories, carried on by Loris Jones at Fountain Square Buildings, Burslem, Stoke-on-Trent. The directors are: R. F. R. Bew, 6, Liverpool Road, Burslem, Stoke-on-Trent, and L. Jones, "Caldy," Watlands View South, Wolstanton, Staffs. Registered office: Fountain Place Buildings, Burslem, Stoke-on-Trent.

McGreevy Brothers (Fleetwood), Ltd.—Private company. Registered November 27th. Capital, £2,000 in £1 shares. Objects: To acquire the business of wholesale, electrical and wireless factors carried on by Thos. McGreevy and Peter McGreevy at Exchange Buildings, Station Road, Fleetwood, as "McGreevy Brothers." The directors are: T. McGreevy and P. McGreevy, both of 33, Manor Road, Fleetwood; and G. E. Bagshaw, 30, Warren Avenue North, Fleetwood.

Alder Electrical Appliances, Ltd.—Private company. Registered November 27th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in electrical wash boilers, gas and oil lamps, quartz lamps, reflectors, bells, fires, stoves, cookers, &c. The directors are: W. Alderson (managing director), Brookside, Cliviger, near Burnley; R. Nutter, 13, Fifth Avenue, Burnley; and J. R. Horsfall, 202, Manchester Road, Burnley.

Neonew, Ltd.—Private company. Registered November 27th. Capital, £100 in £1 shares (51 "A" and 49 "B"). Objects: To adopt agreements (1) with Uneon, Ltd., and (2) with Walter Hill & Co., Ltd., to develop and turn to account the business of marketing, selling and dealing with the signs and other objects manufactured under the grants of patents therein referred to, and to carry on the business of sellers, suppliers and manufacturers of, agents and contractors for and dealers in signs, &c. The subscribers are: J. W. England, 19, Addison Road, Kensington; C. W. Gardner, 67/71, Southampton Row, W.C.1. Secretary: A. S. Wild. Registered office: 67, 69 and 71, Southampton Row, W.C.1.

Scientific & Optical Industries, Ltd.—Private company. Registered November 29th. Capital, £200 in £1 shares. Objects: To carry on the business of designers, improvers and manufacturers of and dealers in electro-medical and general magnetic and galvanic instruments and appliances, opticians, &c. The subscribers are: M. M. Cuthbert, The Park, Bromley Road, S.E.6; and Mrs. M. McCartney, 147, Burnt Ash Hill, Lee, S.E.12.

Westford Radio, Ltd.—Private company. Registered November 29th. Capital, £100 in £1 shares. Objects: To carry on the business of radio dealers and dealers and suppliers of electrical goods, &c. The directors are: A. Pearl and Mrs. V. Pearl, both of 698, High Road, Leytonstone, E.11. Secretary (*pro tem*): W. Symons. Registered office: 698/700A, High Road, Leytonstone, E.11.

Clifford Johnson, Ltd.—Private company. Registered November 25th. Capital, £250 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in sound reproducing instruments and machinery, electrical or otherwise, electrical and other instruments, radio components, &c. The directors are: C. Johnson and Mrs. L. Johnson, both of 53, Danefield Terrace, Otley. Registered office: 19, Boroughgate, Otley.

London Auto-Electric, Ltd.—Private company. Registered November 29th. Capital, £1,000 in £1 shares (300 6 per cent. cumulative preference and 700 ordinary). Objects: To carry on business as manufacturers and repairers of and dealers in all kinds of electrical equipment for motor vehicles, wireless or other installations, &c. The directors are: W. E. Collins and Mrs. M. A. Collins, both of 1, Godstone Road, Kenley. Registered office: 383, City Road, E.C.1.

Lawley Electric Heaters, Ltd.—Private company. Registered November 29th. Capital, £2,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in electric heaters, cookers, and all kinds of electrical equipment, &c. The directors are: Wm. E. Lawley and Mrs. Lilian Lawley, both of "Burnside," Birmingham Road, Wylde Green. Registered office: Lawley Street Wharf, L.M.S.R., Birmingham.

Barnetts Electrical Supply Co., Ltd.—Private company. Registered November 27th. Capital, £250 in £1 shares. Objects: To carry on the business of manufacturers of and wholesale and retail dealers in electrical and radio fittings and installations, electrical and other machinery, articles of furniture, fancy goods, &c. The directors are: M. Barnett, 162, Ripple Road, Barking; J. Barnett, 46, Great Titchfield Street, W.1; Esther R. Noe, 805, High Road, Tottenham, N.17, secretary. Registered office: 46, Great Titchfield Street, W.1.

Electro-Metallurgical Development Co., Ltd.—Private company. Registered November 30th. Capital, £100 in £1 shares. Objects: To carry on the business of electro-metallurgy in all its branches and that of electro-platers and electro-depositors, &c. The subscribers are: W. H. Walford, 10, Lambourne Road, Leytonstone, E.11, and two others. Registered office: Brettenham House, Lancaster Place, Strand, W.C.2.

Returns of Electrical Companies

Edmundsons' Electricity Corporation, Ltd.—Capital, £7,000,000 in 400,000 7 per cent. cum. preference, 2,000,000 6 per cent. cum. preference, and 4,600,000 ordinary shares of £1. Return dated June 8th, 1933. 400,000 7 per cent. preference, 1,250,000 6 per cent. preference, and 3,340,000 ordinary shares taken up. £2,410,400 paid on all the preference and 760,400 of the ordinary shares, £2,579,600 considered as paid on 2,579,600 ordinary shares. Mortgages and charges: £2,500,000 4 per cent. debenture stock and £824,271 5 per cent. debenture stock. Returns of allotments made up to August 2nd, 1933, show a further 146,005 preference shares allotted as fully paid as consideration for purchase of an equal number of shares in the Urban Electric Supply Co., Ltd.

Frank Raworth, Ltd.—Capital, £3,000 in £1 shares. Return dated August 23rd, 1933. 2,222 shares taken up. £2,022 paid. £200 considered as paid. Mortgages and charges, nil.

Playford & Son, Ltd.—Capital, £2,000 in £1 shares. Return dated July 19th, 1933. 1,214 shares taken up. £1,214 paid. Mortgages and charges: £350.

Bowden & Higlett, Ltd.—Capital, £3,000 in £1 shares. Return dated August 29th, 1933. 2,025 shares taken up. £2,025 paid. Mortgages and charges, nil.

Tamplin & Makovski, Ltd.—Capital, £20,000 in 40,000 ordinary shares of 10s. each. Return dated July 10th, 1933. 4,610 shares taken up. £250 paid, £2,055 considered as paid. Mortgages and charges, nil.

Reasonable Radio, Ltd.—The nominal capital has been increased by the addition of £200 beyond the registered capital of £600. The additional capital is divided in 200 deferred ordinary shares of £1 each.

Foulkes Gornall & Co., Ltd.—Mortgage for £560, dated September 27th, 1932, charged on 165, Frankwell, Shrewsbury, acquired by the company on October 18th, 1933. Registered pursuant to Section 81 of the Companies Act, 1929. Mortgagee: Leeds Permanent Building Society.

Geo. Cooper (Electricians), Ltd.—Debenture dated November 18th, 1933, to secure £2,500, charged on the company's undertaking and property, present and future, including uncalled capital and book debts. Holders: Z Electric Lamp & Supplies Co., Ltd., 21, Newman Street, W.1.

Vergette & Co., Ltd.—H. C. Mundy, 194, Lavender Hill, S.W.11, ceased to act as receiver on November 18th, 1933.

Dicona, Ltd.—Debenture dated November 7th, 1933, to secure £1,500, charged on the company's undertaking and property, present and future, including uncalled and unpaid capital. Holder: E. J. Knight, Apsley House, 4, Vernon Street, Derby.

W. & A. G. Lambert, Ltd.—Particulars filed of £400 debentures authorised November 15th, 1933, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Revo Electric Co., Ltd.—The nominal capital has been increased by the addition of £5,000 in £1 ordinary shares beyond the registered capital of £175,000.

Electro-Rentals, Ltd.—The nominal capital has been increased by the addition of £14,900 in £1 ordinary shares beyond the registered capital of £100.

Harris & Lawson, Ltd.—Particulars filed of debentures, not exceeding £200, authorised September 22nd, 1933, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £200.

York Relay Services, Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated November 1st, 1933, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Gosport & Alverstoke Electric Lighting Co., Ltd.—Capital, £35,000 in £10 shares. Return dated May 30th (filed August 12th), 1933. 2,500 shares taken up. £25,000 paid. Mortgages and charges, nil.

Llangollen & District Electric Light & Power Co., Ltd.—Capital, £6,000 in 2,500 preference and 3,500 ordinary shares of £1. Return dated June 16th, 1933. 360 preference and 1,753 ordinary shares taken up. £2,113 5s. paid (including 5s. paid on one ordinary share forfeited). Mortgages and charges: £2,600.

Drury Radio Co., Ltd.—Capital, £2,000 in £1 shares. Return dated August 9th, 1933. All shares taken up. £2,000 paid. Mortgages and charges, nil.

Buckrose Light & Power Co., Ltd.—Capital, £50,000 in £1 shares. Return dated July 7th, 1933. All shares taken up. £50,000 paid. Mortgages and charges, nil.

Ashton Electrical Co. (Preston), Ltd.—Capital, £1,500 in 1,250 ordinary and 250 founders' shares of £1. Return dated June 14th, 1933. All shares taken up. £1,350 paid, £150 considered as paid. Mortgages and charges: £1,071 15s. 11d.

Stamford Electrical, Ltd.—Mortgage on Park Works, Barnack Road, Stamford Baron, Northants, dated November 16th, 1933, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Cycletric Traders, Ltd.—The nominal capital has been increased by the addition of £400 in £1 ordinary shares beyond the registered capital of £100.

Walsh & Stevenson, Ltd.—T. Hayes, 13, Greek Street, Leeds, ceased to act as receiver on November 23rd, 1933.

Unity Heating, Ltd.—Satisfaction in full (1) on December 10th, 1929, of charge dated July 16th, 1926, and registered July 21st, 1926, securing £1,500, (2) on October 23rd, 1930, of charge dated September 28th, 1929, and registered October 15th, 1929, and (3) on same date of charge dated April 4th, 1930, and registered April 17th, 1930. Notices filed November 13th, 1933. (According to the register of mortgages, the only charges registered October 15th, 1929, and April 17th, 1930, were a memorandum of deposit which originally secured all moneys due to bank not exceeding £7,000 and £5,000, respectively.)

City Notes

Amalgamated Wireless (Australasia), Ltd.—The shareholders have approved the action of the directors in refusing to submit to the Federal Government a scheme whereby the beam wireless services of the company would be transferred to the Post Office department. Mr. C. P. Bartholomew, the acting chairman, said the directors felt that such proposals should originate with the Government. Since the Government joined the company's enterprise it had received about £152,000 in dividends. Mr. Bartholomew also said that the Commonwealth authorities had not yet ratified the agreement with International and Imperial Communications, Ltd., for the administration by Amalgamated Wireless of cable traffic from Australia. The Government's intentions are expected to be made known soon. It holds 500,001 of the million Amalgamated Wireless shares, and it would require about £500,000 to compensate the private shareholders if it took over all the company's activities, which comprise the operation of radio-telegraph and telephone services and the manufacture of receiving and transmitting equipment. The Government desires only to control the communications, but the shareholders object to such a division.

Enfield Rolling Mills, Ltd.—Presiding at the annual meeting on December 5th, the Earl of Verulam (chairman) said the zinc rolling mill started work last September in rolling zinc sheets and strips. They had now completed a large copper smelting and refining installation which was about to start work. The next department to get going would be the strip and sheet mills for rolling copper and other non-ferrous metals and the apparatus shop. They had secured a staff of highly trained experts, which would enable them to develop numerous new processes which had not hitherto been attempted in this country. The zinc can manufacturing department, carried on at Tottenham by their subsidiary Enfield Zinc Products, Ltd., had been running since last June, at first on imported zinc raw material and lately on zinc from mills at Brimsdown. Zinc cans were ordered in "astronomical" quantities and were used in the manufacture of dry batteries. With regard to prospects, inquiries were coming in freely and they would not lack initial orders.

Jarrow & Co. reports a net profit for the year ended June 30th last of £20,111, as compared with £18,479 in the preceding year. The dividend is maintained at 5 per cent., £10,000 is placed to reserve, and £21,972 is carried forward (against £19,361 brought in).

The Aron Electricity Meter, Ltd., proposes to redeem the whole of the outstanding amount of income debenture stock (£92,475) at 105 on December 31st next.

Marco Refrigerators, Ltd., reports a net profit for the year ended September 30th last of £6,064, as compared with £841 in 1931-32, which reduces the debit balance carried forward to £5,411.

John I. Thornycroft & Co., Ltd., reports a net loss for the year ended July 31st last of £101,122, as against a loss of £177,538 in the preceding year. A sum of £100,000 is withdrawn from reserve, and, after deducting the balance of £1,122 from £4,569 brought in, a sum of £3,447 is carried forward.

The Scottish Power Co. proposes to increase its capital to £6,000,000 by the creation of a further 1,000,000 shares of £1 each. A resolution approving the proposed increase was to come before a meeting held yesterday. A portion of the new capital is required to provide funds for capital works in progress or under construction.

The Yorkshire (West Riding) Electric Tramways has announced the half-yearly payment on the 6 per cent. preference shares.

The Melbourne Electric Supply Co., Ltd., intends to redeem on June 1st next the whole of the 6 per cent. redeemable general mortgage debenture stock then outstanding at 102½ per cent., plus accrued interest. The amount of stock now outstanding is £266,253.

The Burma Electric Supply Co., Ltd., reports a net profit of £7,285 for the year ended July 31st last, including £1,545 transferred from exchange reserve, and after placing £3,500 to general reserve and depreciation. To this is added £7,673 brought in, and after paying the preference dividend (£7,200), a balance of £7,759 is carried forward.

The British Columbia Power Corporation has announced a dividend of 37 cents on the "A" shares for the quarter ending December 31st. The directors state that the quarterly dividends will now be alternately 37 cents and 38 cents, making an annual rate of $1.50. The total for the preceding year was $2 in quarterly dividends of 50 cents.

The Globe Telegraph & Trust Co., Ltd., has declared a quarterly dividend of 1s. per £10 share on the ordinary shares (same).

The Brazilian Traction, Light & Power Co. has announced a quarterly dividend of 1½ per cent. on the preference shares.

Stocks and Shares

TUESDAY EVENING.

THE difference in the volume of business now being transacted in the Stock Exchange markets as compared with that of a month ago is remarkable, trade having fallen off to a surprising extent, for reasons which may be described mainly as political. These are closely intertwined, however, with finance. Too much may be made, it is true, of the influence that the fluctuations in the dollar exchange is exerting over prices, but there are few avenues of commerce and industry with which City men come into contact that do not yield a certain amount of tribute to the effect that the American uncertainty has upon their particular business. On the Continent, the Hitler policy is fraught with an uncertainty that has the effect of driving money to our own country, although other counter influences are sufficiently strong to prevent any improvement in quotations of gilt-edged securities. The prices for stocks in the public boards—Central Electricity and others—show no alterations on the week other than those due to ex dividend markings. There are, however, rather more sellers than buyers, a condition which may be ascribed, of course, to the ordinary seasonal developments that are expected to restrain purchasers from investing money so near to the New Year.

"Window-dressing"

Against this may be set the knowledge that for any stock that comes to market at a relatively tempting figure there are many buyers. The trust companies, banks, and other financial undertakings are at their wits' end to know how to employ surplus capital. Such companies as these will not miss the opportunity for picking up stock—provided it is offered at what they consider to be a reasonable price—merely because payment has to be made a few weeks before window-dressing requirements are considered.

It will be observed, by reference to the price lists, that the 5 per cent. stock of the West Midlands Joint Electricity Authority is added to our tables. The price stands at 114. The stock is dated 1948-1968. Interest payments are due on the 1st of April and October. For the sake of comparison it may be pointed out that Central Electricity 5 per cent. stock, dated 1960-1970, and with interest on the 1st of March and September, is quoted also at 114. The stocks of most of these public boards stand upon practically the same level of yield, the differences in price being caused, of course, by variations of yield, redemption dates and interest disbursements.

Dollar Stocks

People on this side of the Atlantic are becoming afraid to touch dollar stocks. Brazilian Tractions have fallen ¾ upon a statement that Brazilian agriculturists will be allowed to pay no more than half their debts for a time. Hydro-Elec-

trics have come back to 5¾. The Mexican issues show no movements.

The "rubber dollar" is reputed to affect the quotation for rubber produce, but, as a market factor, this has been superseded by anticipations of a conference, held this week in Batavia, agreeing upon restriction of output. But capital, as already noticed, is seeking employment-with-safety in our own country. Iron and steel shares reflect, in their firmness, this increasing disposition. An American millionaire put £30,000 last week into the ordinary shares of sound British industrial companies.

Cables and Wireless

At 68¼, Cables & Wireless 5½ per cent. preference stock shows a loss of 2 points, the ordinary being marked down to 22, and the "B" ordinary to 10. Once more, it will be noticed, £100 nominal of each class of stock can be purchased for little more than £100 cash. According to market report, a fair amount of the preference stock has recently come in for sale on behalf of a deceased account, and, with speculative investments at a low ebb, the presence of any block, even though it be a small one, has an unduly depressing effect. In sympathy with these declines, Globe Telegraph & Trust preference eased off to 12, at which price the return on the money is 5 per cent. Great Northern Telegraphs, after their recent heaviness, show a tendency to recover. The price, at 32, is 10s. up. Anglo-American Telegraphs are a little easier for the reason mentioned here last week, namely, the uncertainty caused by the violent fluctuations in the American exchange. American Telephone & Telegraphs at 112½ show a loss of 4 points. It is said that a bear account exists, sales having been made in the expectation that the dividend may be reduced, in regard to which, however, the recent announcement of the regular 2¼ per cent. for the quarter offers effective comment for the time being. International Telegraphs are 12½, Jutland Telephone 5½ per cent. bonds, guaranteed by the Danish Government, continue in request on the basis of 105. The company has the right to pay off the bonds at 100 upon giving six months' notice of its intention to do so. New York Telephone 4½ per cents changed hands a few days ago at 95, and Anglo-Portuguese Telephone ordinary shares at 26s. 9d. Oriental Telephones hold their improvement at 3 1/16. A quiet demand for Marconi Marines served to put up the price to 27s. 6d.

Scottish Power's New Capital

Scottish Power ordinary shares have strengthened to £2. The company has convened a meeting, to be held on the Thursday in this week, for the purpose of raising additional capital. The resolution is hardly likely to be treated otherwise than favourably, but the proposed price of the new issue has not yet been made public. It is, of course, in anticipation of this providing a bonus that Scottish Power have strengthened, as just mentioned. Whitehall Electric Investments 7½ per cent. preference recovered 1/8 to 18s. 9d. No special reason transpired to account for the recent fall in the price of the shares. Isle of Thanet ordinary are dull at 30s. Edmundson's ordinary at 37s. 6d. and Lancashire Electric 6 per cent. preference at 35s. show small advances.

New Shares

Metropolitan Electric new shares are quoted at 12s. premium. Tuesday in this week was the final day for sending in applications for the shares. Proprietors of Metropolitan Electric shares have recently been approached by a gentleman writing from the North-West of London, who has bid 5s. premium for these new shares, pointing out that if the proprietors cared to sell them to him, this would relieve them of any responsibility for calls, &c. As the price in the market has not recently been less than 11s. 3d. bid, it cannot be said that the offer is a very generous one. It may indeed, be hoped that this impudent bid failed in its effort to get holders to sell the shares at a premium less than half of that which could have been obtained by a sale in the Stock Exchange market.

West Devon new ordinary shares are 1s. 9d. premium, being a shade easier than a week ago. The preference keep about 7½d. premium. Hendons at 56s. are slightly better. Insignificant declines occurred in Llanelly ordinary at 25s. 6d., and Newcastle and District at 36s. 3d. Atlas ordinary are a shade down at 8s. British Power & Light show no change at 19s. 9d.

Manufacturing and Equipment

The dullness which last week overtook the ordinary shares in the manufacturing and equipment companies is still apparent in the list of prices. Enfield Cables at 92s. 6d. are again 1/8 down. Callenders remain heavy at 3 3/16, Henleys at 6 3/16; British Aluminium ordinary at 27s. are 1s. lower. On the other hand, British Insulated ordinary recovered to 72s. 6d., and General Electric ordinary at 2½ are also 1/8 higher on the week. A minor feature in the miscellaneous market has been a jump in Associated Equipment ordinary shares. After rising to 37s., and going back to 23s., the price has recovered to 28s. 6d., at which latter figure the shares are held, in some directions, to be reasonably valued. The spasm of selling came upon a market reluctant to buy more shares than a home could be found for straight away. Ericsson Telephones ordinary kept firm at 57s. 3d., Crompton Parkinson ordinary have also maintained their rise at 22s. 6d. British Electric Transformer preference at 21s. 3d. are firmer.

Share List of Electrical Companies

	Nom.	Approx. Dividend. 1931.	1932.	Price, Dec. 5.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	78/3	—	3 17 0
Brompton Ordinary	1	8½	7	34/–	—	4 2 4
Charing Cross Ordinary	1	8½	7	34/6	—	4 1 2
Chelsea	1	8½	7	34/–	+6d.	4 2 4
City of London	1	10	10	35/–	—	4 0 0
Clyde Valley	1	7	7	40/–	—	3 10 0
County of London	1	10½	10½	55/–	—	3 12 8
Edmundson's 7% Pref.	1	7	7	34/–	—	4 2 4
Elec. Dis. Yorkshire	1	9	9	46/3	—	3 18 0
Elec. Supply Corporation	1	11	11	78/9	—	2 15 6
Kensington Ordinary	1	8	7	34/–	—	4 2 4
Lancs Light and Power	1	7	7	35/–	—	4 0 0
London Electric	1	9	7	34/6	—	4 1 2
Metropolitan	1	10	10	52/6	—	3 16 0
Midland Counties	1	7	7	37/–	—	3 15 8
Mid. Elec. Power	1	8	8	45/–	—	3 11 1
North Eastern Electric Ordinary	1	6	6	34/–	—	3 10 8
Do. 7% Pref.	1	7	7	34/–	—	4 2 4
Northampton	1	10	10	55/–	—	3 12 9
Notting Hill 6% Pref.	10	6	6	13¾	—	4 8 11
North Met. Elec. 6% Pref.	1	6	6	30/–	—	4 0 0
St. James' and Pall Mall	1	8	7	34/–	—	4 2 4
Scottish Power	1	8	8	2	+ 1/8	4 0 0
South London	1	8½	7	34/6	—	4 1 2
Westminster Ordinary	1	8½	7	34/6	—	4 1 2
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	17/6	—	8 11 6
Yorkshire Elec.	1	8	8	46/3	—	3 9 3
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	114	—	4 7 6
Do. 1955–75	„	5	5	115	—	4 7 0
Do. 1951–73	„	4½	4½	106xd.	—	4 5 0
Do. 1963–93	„	—	5½	93	—	3 15 3
London & Home Counties, 1955–75	„	4½	4½	110	—	4 1 10
London Passenger Transport, A	„	—	4½	114½xd.	—	3 18 7
Do. do. B	„	—	5	118xd.	—	4 4 9
Do. do. C	„	—	—	80	—	—
West Midlands Joint Elec. 1948-68	„	—	5	114	—	4 7 6
TELEGRAPH AND TELEPHONES.						
American Tel. & Tel.	$100	9	9	112½	—4	8 0 0
Anglo-Am. Tel. Pref.	Stock	6	6	113½	—½	5 4 0
Do. Def.	„	1½	1½	29½	—½	5 1 8
Cables & Wireless 5½% Pref.	„	2¾	2¾	68½	—2	4 0 4
Do. A 7½% Ord.	„	Nil	Nil	22	—½	—
Do. B Ord.	„	Nil	Nil	10	—½	—
Globe Tel. and T. Ord.	10	Nil	2½	10	—	2 10 0
Do. do. Pref.	10	6	6	12	—½	5 0 0
Great Northern Tel.	10	20	20	32	+½	6 5 0
Marconi-Marine	1	10	7½	27/6	+ 1/8	5 9 1
Oriental Telephone Ord.	1	12	12	3 1/8	—	*3 18 4
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	3/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	1/6	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	6	—	—
British Electric Traction Df. Ord.	„	5	5	450	—	—
Do. do. Pref. Ord.	„	8	8	144½	—	5 10 9
Brazil Traction	100	—	—	10¾	—¼	—
Brit. Columbia Elec. Rly. Pfe.	Stock	5	5	103	—	4 17 0
Mexico Trams, 5% Bonds	—	5	5	27½	—	18 3 8
Mexican Light Common	100	Nil	Nil	7½	—	—
Do. 7% Pref.	100	7	7	11	—	—
Do. 1st Bonds	—	5	5	40	—	12 10 0
Victoria Falls Ord.	1	15	20	5 1/8	—	3 19 0
Yorkshire (West Riding)	1	Nil	Nil	15/–	—	—
MANUFACTURING COMPANIES.						
Assoc. Elec. Ord.	1	4	4	17/9	—	4 10 4
Do. Pref.	1	8	8	33/3	—	4 16 6
Babcock & Wilcox	1	14	9	38/3	—	—
British Aluminium Ord.	1	5	5	27/–	—1/–	3 14 2
British Insulated Ord.	1	15	15	72/6	+ 1/8	4 2 8
Brush Ord.	Stock	Nil	Nil	40	—	—
Callender's	1	15	15	63/9	—	4 14 4
Do. 6½% Pref.	1	6½	6½	31/3	—	4 3 2
Crompton Parkinson Ord.	5/–	22½	12½	22/6	—	—
Do. 8% Pref.	1	8	8	31/3	—	5 2 5
Edison-Swan 1st Pref.	1	7½	7½	24/6	—	6 2 5
Do. 5% Deb.	Stock	5	5	102½	—	4 17 7
Electric Construction	1	Nil	Nil	10/–	—	—
Enfield Cable Ord.	1	25	25	92/6	— 1/8	5 7 5
English Electric	1	Nil	Nil	7/6	—	—
Do. do. Pref.	1	Nil	Nil	11/3	—	—
Ever Ready	5/–	35	35	29/–	—6d.	6 0 8
Ferranti Pref.	1	7	7	28/–	—3d.	5 0 0
G.E.C. Pref.	1	6½	6½	32/–	—	4 1 2
Do. Ord.	1	8	8	42/6	+ 1/8	3 15 3
Henley's	1	30	30	6 1/8	—	4 17 1
Do. 4½% Pref.	5	4½	4½	5½	—	4 5 9
India-Rubber Preferred	1	—	—	15/–	— 1/8	—
Johnson & Phillips	1	5	5	19/6	—	5 2 7
Siemens Ord.	1	7½	6½	20/–	—	—
Telegraph Construction	£1	Nil	Nil	28/9	—	—

* Dividends paid free of Income Tax

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1931

13495. "Electrical storage cells." J. A. Downing and T. Blake. February 8th, 1932. (401281.)

1932

4309. "Electric switches with gas-blast blow-out means." E. Lange. February 13th, 1932. (401332.)

9256. "Electric fuses." R. H. Abell. March 31st, 1932. (401334.)

9653. "Television or like systems." G. B. Banks and Baird Television, Ltd. April 4th, 1932. (401311.)

12247. "Commutators for electrical machines." General Electric Co., Ltd., and N. F. T. Saunders. April 28th, 1932. (401289.)

12481. "Control of electrically driven vehicles." British Thomson-Houston Co., Ltd., and J. H. Cansdale. April 30th, 1932. (401303.)

12626. "Electric motors." General Electric Co., Ltd., and N. F. T. Saunders. May 2nd, 1932. (401292.)

12643. "Thermionic valves." S. F. Warren. May 2nd, 1932. (401305.)

12661. "Electric tumbler switches." J. A. Crabtree. May 3rd, 1932. (401271.)

12768. "Voltage regulators." A. C. Lock and Simms Motor Units, Ltd. May 3rd, 1932. (401306.)

12837. "Electrical wave filters." Ingranic Electric Co., Ltd., and L. H. Paddle. May 4th, 1932. (401316.)

12882. "Control of electric motors." H. K. Ramsden, W. B. G. Collis, and Associated Electrical Industries, Ltd. May 4th, 1932. (Cognate application 17317/32.) (401293.)

12980. "Intermediate-frequency transformers for use in wireless reception." V. G. V. Colle and Ward & Goldstone, Ltd. May 5th, 1932. (401319.)

13009. "Means for cooling electric discharge metal-vapour containers." International General Electric Co., Inc. May 6th, 1931. (401308.)

13140. "Electric-lamp fittings for illuminated signs." London Sand Blast Decorative Glass Works, Ltd., and E. W. Beagle. May 6th, 1932. (401321.)

13179. "Alternating-current electrical instruments." Elliott Bros. (London), Ltd., and G. F. Shotter. May 7th, 1932. (401277.)

13191. "Cooling apparatus for transformer tanks and like uses." St. George's Engineers, Ltd., J. Anderson, and H. Purslow. May 7th, 1932. (401278.)

13433. "Carrier-wave telephony systems." Igranic Electric Co., Ltd., and L. H. Paddle. May 10th, 1932. (401323.)

13518. "Swivelling bases for overhead electric trolley poles." S. S. Guy. May 11th, 1932. (401344.)

13682. "Water-cooling systems for electron-discharge tubes." C. Lorenz Akt-Ges. May 15th, 1931. (401348.)

13683. "Selecting devices for type-printing telegraphy, and/or electric signalling systems." International Communications Laboratories, Inc., and E. P. Bancroft. May 12th, 1932. (401349.)

13703. "Magnetic cores of powdered material." Telefonaktiebolaget, L. M. Ericsson. May 13th, 1931. (401352.)

13735. "Telephone systems." Automatic Electric Co., Ltd. May 29th, 1931. (401354.)

13738. "Light sources for use in television and similar systems." Marconi's Wireless Telegraph Co., Ltd., A. W. Appleton, and D. L. Plaistowe. May 12th, 1932. (401355.)

13803. "Cases for electric batteries or holders therefor." J. Lucas, Ltd., and O. Lucas. May 13th, 1932. (401359.)

14344. "Electric trolley-bus brakes." Electro-Mechanical Brake Co., Ltd., and G. N. Cadbury. May 20th, 1932. (401377.)

14628. "Electric discharge devices." British Thomson-Houston Co., Ltd. May 25th, 1931. (401379.)

15080. "Electric discharge tubes." Fidelity Films, Ltd., and C. P. Ryan. May 27th, 1932. (401382.)

15554. "Electric control systems for elevators and the like." British Thomson-Houston Co., Ltd. June 1st, 1931. (401389.)

15584. "Electromagnetically operated electric switches." L. A. Ramsden. June 2nd, 1932. (401390.)

16097. "Telephone systems." Siemens Bros. & Co., Ltd., W. H. Grinsted, C. L. Peters and D. A. Christian. June 7th, 1932. (401394.)

16203. "Enclosed electrical fuses." C. J. Baker and D. Foster. June 8th, 1932. (401396.)

16808. "Insulated electric conductors." J. H. Young and H. H. Robertson Co. June 14th, 1932. (401401.)

16960. "Method of converting polyphase current of a given frequency into a single-phase current of a smaller frequency." Akt.-Ges. Brown, Boveri et Cie. June 15th, 1931. (401404.)

19050. "Electrically operated automatic ratchet-and-pawl mechanism." A. Greatorex, G. W. Braham and E. C. Melhuish. July 5th, 1932. (401423.)

19630. "Electromagnetic separators." S. Morris. July 12th, 1932. (401430.)

19796. "Automatic or semi-automatic telephone systems." General Electric Co., Ltd., and R. M. Hamilton. July 13th, 1932. (401433.)

25361. "Gasfilled discharge tubes, particularly incandescent cathode rectifier tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. September 12th, 1931. (401471.)

26613. "Permanent magnets." W. Jessop & Sons, Ltd., and J. E. Gould. September 26th, 1932. (401476.)

28995. "Electric vulcanisers." Macintosh Cable Co., Ltd., R. F. D. Milner and T. Elder. October 17th, 1932. (401486.)

29713. "Electric arc-welding process for welding aluminium or aluminium alloys." M. Zack. November 3rd, 1931. (401487.)

30015. "Electrical measuring circuits and apparatus therefor." British Thomson-Houston Co., Ltd., G. R. R. Bray and K. J. R. Wilkinson. October 26th, 1932. (401488.)

31962. "Electric ovens." L. W. Wild and Wild-Barfield Electric Furnaces, Ltd. November 11th, 1932. (Addition to 334621.) (401493.)

35981. "Enclosed electric arc lamps." General Electric Co., Ltd. December 21st, 1931. (401509.)

36120. "Magnets for moving-coil loud speakers." General Electric Co., Ltd., and D. A. Oliver. December 20th, 1932. (401510.)

1933

3767. "Electric musical instruments." N. A. Palmgren. February 8th, 1932. (Cognate application 3768/33.) (401537.)

4562. "Electric discharge tubes." Elektrische Gluhlampenfabriken J. Kremenezky Akt.-Ges. February 16th, 1932. (401542.)

4896. "Electrically driven screwdrivers." R. Bosch Akt.-Ges. February 29th, 1932. (401545.)

5718. "Electric resistance devices." British Thomson-Houston Co., Ltd. February 25th, 1932. (401547.)

6139. "Power-transmission coupling devices for electric locomotives." British Thomson-Houston Co., Ltd. February 29th, 1932. (401552.)

6738. "Electric annealing plant for bars and tubes." Allmänna Svenska Elektriska Aktiebolaget and L. Hogel. March 6th, 1933. (401559.)

6748. "Electric cables." C. H. F. Muller Akt.-Ges. March 7th, 1932. (401560.)

6943. "Thermionic valve supporters and the like." J. C. Wilson and Baird Television, Ltd. March 7th, 1933. (401561.)

7328. "Television systems." Marconi's Wireless Telegraph Co., Ltd. March 22nd, 1932. (401563.)

7543. "Method for the arbitrary distortion and correction of wireless or wire-transmitted alternating currents, such as speech and signal alternating currents, of superimposed disturbance alternating currents." E. Kasemann. January 20th, 1933. (401564.)

7950. "Electrostatic precipitators." Research Corporation. July 13th, 1932. (401566.)

8772. "Electrodes for electron-discharge devices." Igranic Electric Co., Ltd. March 26th, 1932. (401568.)

9866. "Methods of coating electric incandescent filaments." British Thomson-Houston Co., Ltd. April 1st, 1932. (401576.)

9951. "Electric dynamometers for indicating a ship's speed and for other purposes." E. Granat and Compagnie des Forges et Acieries de la Marine et d'Homecourt. June 4th, 1932. (401577.)

10605. "Electric harpoons." A. Foyn. April 8th, 1932. (401582.)

10859. "Impulse transmitters for use in telephone systems." Telephone-apparat-fabrik E. Zweitusch & Co. Ges. May 17th, 1932. (401586.)

10905. "Sparking-plug with a piezo-electrical pressure-measuring device." Radioakt-Ges. D., S. Loewe and W. Gutzke. April 15th, 1932. (401587.)

13756. "High-frequency transmitting arrangements." Marconi's Wireless Telegraph Co., Ltd. June 22nd, 1932. (401600.)

14406. "Phase-sequence components segregation apparatus." Westinghouse Electric & Manufacturing Co. May 25th, 1932. (401601.)

15963. "Acoustic signalling systems." Naamlooze Vennootschap Machinerieen-en Apparaten Fabrieken. July 13th, 1932. (Addition to 389003.) (401610.)

16545. "Electric resistance welding machines." E. G. Budd Manufacturing Co. June 11th, 1932. (401611.)

21292. "Insulating electrical conductors." A. F. Fekete. February 10th, 1931. (Divided application on 3975/32.) (401368.)

21496. "Rotary fans." British Thomson-Houston Co., Ltd. July 30th, 1932. (401625.)

26019. "Electrical circuits for producing oscillations of non-sinusoidal wave form for use, for example, with cathode-ray devices." Electrical & Musical Industries, Ltd., and M. Bowman-Manifold. May 26th, 1932. (Divided application on 15011/32.) (401634.)

26876. "Thermionic valves." S. F. Warren. May 2nd, 1932. (Divided application on 401305.) (401296.)

27284. "Systems for controlling electric motors." W. T. Gray and Associated Electrical Industries, Ltd. April 4th, 1932. (Divided application on 9632/32.) (401310.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections may be entered against any of the proposed marks within one month from November 29th :—

Volplus. No. 545425. Class 8. Radio-telegraphic and telephonic instruments and parts thereof, and electric batteries (not for medical purposes).—Hobday Bros., Ltd., 21-27, Great Eastern Street, E.C.2.

Expresvolt. No. 545426. Class 8. Radio-telephonic and telegraphic instruments and apparatus and parts thereof, and electric batteries (not for medical purposes).—Express Radio Factors, Ltd., 25, Great Eastern Street, E.C.2.

Fenbo. No. 545669. Class 13. Electric lamps (ordinary).—Bertram B. Fenn, Ltd., Fenbo House, Great Chapel Street, W.1.

Larch Poles for Transmission Lines

A BRITISH Standard Specification for Larch Poles for Transmission Lines which has just been published is of particular interest in view of the prejudice with which larch poles have been regarded for some time. Characteristics peculiar to larch, which militated against the use of poles of this species in the past, are the tendency for seasoning checks to become localised, rendering the pole unsafe for climbing with spurred climbing irons, and also the twisting that takes place at the top of the pole, occasioned by the spiral grain. It is, however, considered now possible to control the former by suitable treatment, while the second, which is only of small account if the points of attachment of the conductor are close to the pole, can be eliminated by specification. Copies of the new Specification (No. 513-1933) may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1. Price 2s. 2d. post free.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Auchterarder (PERTHSHIRE).—Addition to Crown Hotel; J. McCreadie, proprietor.

Barking.—Houses (265), Movers Lane Estate; borough architect. Maternity home, fire station, &c.; borough engineer.

Batley.—Houses (32) and bungalows, Purlwell Lane Estate; borough engineer.

Bedford.—Bus depôt, St. John Street, for the Eastern National Bus Co.; A. L. Wallace. School (920 places), London Road, for E.C. Reconstruction of M.C.C. bat works, Tavistock Street; T. A. Gray.

Billingham-on-Tees.—Public swimming baths (£18,000); J. J. Hill, U.D.C. surveyor.

Birmingham.—Houses (60), Blythswood Road, Hall Green; Jones & Croxford, architects, 29, Waterloo Street. Additions to First Avenue for Parkinson Stove Co. (£5,000) with electrical work; E. G. Brown & Sons, builders, Yardley Fields Road, Stechford. Alterations to McKechnie Bros., Ltd., Rotton Park Street; C. Green & Sons, builders, Ladywood.

Bishopbriggs.—Houses (48), Morrison's Park, Springfield; County Offices, 181, Ingram Street, Glasgow.

Blackburn.—Branch bank, Church Street, for the Union Bank of Manchester, Ltd., York Street; Sames & Green, architects, 14, Richmond Terrace.

Blackheath (STAFFS).—Houses (80), Feldon Estate; E. Fletcher, surveyor, Cradley Heath, Birmingham.

Blackpool.—Technical college (£60,000), for E.C.

Blaydon-on-Tyne.—Houses (24), Winlaton Hill; N. T. Barker, builder, Rowlands Gill.

Brighton.—Extensions, Whitehawk schools (£11,900), for Borough E.C.; director of education.

Burslem (STAFFS).—Additions to War Memorial Hospital, High Lane; Governors.

Burton-on-Trent.—School, Clarence Street (560 places), for Borough E.C.; Home & Knights, architects.

Bushey.—Post office, Clay Hill, for H.M. Office of Works, King Charles Street, London, S.W.

Cambridge.—Extensions, Perse School, including new science laboratories and lecture and art rooms, &c.; W. A. Forsyth, architect, London.

Carlyon Bay (CORNWALL).—Hotel (electrical and heating work); Crinnis Development Syndicate, Ltd.

Chelmsford.—Houses, St. Fabian's Estate, for S. E. Moss. Testing room, Mildmay Road; Marconi Wireless Telegraph Co., Ltd.

Chesterfield.—Houses (58), Broughton Lane, Clowne for Oxcroft Colliery, Shuttlewood; F. Haslam, Ltd., builders, Regent Chambers, Hall Cross, Doncaster. Houses (20), Eckington; Houfton & Kington, R.D.C. architects, Market Place. Houses (52), Highfield Estate, for Ideal Estates (Doncaster), Ltd. Houses (21), Malvern Road, for A. Heath. Houses (20), Brimington Road, for Marsden & Smith. Works extensions, Whittington Moor, for J. King & Son, Ltd.

Chester-le-Street.—Houses (50), Bullion Lane Estate; U.D.C. surveyor.

Clacton-on-Sea.—Extensions to electricity works, meter room, &c.; electrical engineer and manager.

Chorley.—Houses (28), Isleworth Drive; Gillibrand Estates, Ltd.

Cosham (HANTS).—Church (£6,000)), for the Baptist trustees; Rev. E. D. Saunders, pastor.

Cowley.—Houses (20), Napier Road; F. & R. Lewis, Ltd. Houses (22), Oliver Road; R. Gardner & Sons.

Croydon.—Extension, Mayday Hospital, for the Ministry of Health.

Dewsbury.—Offices, Huddersfield Road, for Hartley Bros. (Ravensthorpe), Ltd.; H. Green, builders, 556, Huddersfield Road, Ravensthorpe.

Durham.—School, Easington, and school clinic and welfare centre, Blaydon-on-Tyne, and alterations to Consett, Leadgate, and Pickering schools; F. Willey, county architect, 34, Old Elvet.

East Bedfont (MIDDLESEX).—Children's home; county architect.

Eastleigh (HANTS).—Houses (106), Longmead Avenue, Bishopstoke, for G. Blake. Re-erection of carriage and wagon works sawmills (£80,000), for the Southern Railway Co.

East Tilbury (ESSEX).—Factory extensions, &c., for Bata Shoe Co. (British), Ltd.

Enfield.—Houses (200), Hoe Lane and Carterhatch Lane; Reynolds Development Co. Thirteen shops, Hartford Road; W. Goodchild & Co.

Erdington (NEAR BIRMINGHAM).—Welfare centre, Marsh Lane; Nichol & Nichol, architects, 117, Colmore Row, Birmingham.

Essex.—Senior school, Pitsea (£21,312), for County E.C.; W. A. Mewburn & Co., builders, Harlow. Extensions, King Edward VI School, Chelmsford, and senior school, Upminster (£36,046), for County E.C.; J. Stuart, county architect, Chelmsford.

Fenton.—Workshops for the blind (£30,000); Alderman H. Leese, Chairman of the Blind Welfare Committee.

Fleetwood.—Houses (130), West View, Broadway, for J. Roskell.

Frating (ESSEX).—Houses (26), Colchester-Thorpe Road, for J. H. Turner.

Gateshead-on-Tyne.—Houses (24), in flats; J. G. Bennison, builder, 8, Harcourt Park. Drapery stores for Doggarts, Ltd. (£30,000); G. Baines & Son, architects, 121, Victoria Street, S.W.1.

Glasgow.—Houses (48), Elmvale Road; housing director and trade contractors. Cinema, Blairgowrie Road; John C. M'Kellar, Ltd. Cinema, Paisley Road West; J. Hay. Additions to Munro Place, Anniesland, for Birrell, Ltd.; G. S. Boswell, 256, West George Street. Extensions, Hawkhead Mental Institution; city engineer.

Gosport.—Town Hall, Walpole Park; borough surveyor.

Grantham.—Hospital extensions; Traylen & Lenton, architects.

Hanley.—Shopping centre, Stafford Street; C. McIlroy.

High Wycombe.—Houses (220), Desborough Castle site; borough surveyor.

Hillingdon.—School, Long Lane (£11,699); W. Lacey, Hounslow.

Lancaster.—Baths; borough engineer.

Liverpool.—Additions to Ashfield Council School, Page Moss Lane (£18,000), with electrical work; R. Wearing & Son, builders, West Derby. Additions to Dovecot Senior School (£12,000), with electrical work; J. Williams (Liverpool), Ltd., builders, Collingwood Street.

London.—(BERMONDSEY).—Housing schemes (£65,000); borough engineer. (DULWICH).—Ante-natal clinic, Dulwich Hospital, for L.C.C.; J. & C Bowyer, Ltd., builders, Upper Norwood. (EALING).—Shops and flats, Ealing Broadway; Mr. Peppiatt. (EDMONTON).—Alterations to Alcazar Picture Theatre; manager. (FINSBURY).—Tenements (40), Cyrus Street (£19,000); borough engineer. (HAMMERSMITH).—Blocks of flats, Richford Street and Wells Road; M. Rosenauer. (HORNSEY).—Alterations to Crouch End Hippodrome; manager. (LAMBETH).—Flats (52), Flaxman Road; Church Army Housing, Ltd. (SOUTHGATE). —Houses (170), Chase Vale Farm Estate; Geo. Wimpey & Co., Ltd. Cinema, Bourne Hill; T. Woolnough. (WANDSWORTH).—Motor repair depôt, for L.C.C., Camborne Road (£23,017); Rowley Bros., Ltd. (WOOLWICH).—Municipal offices (£20,979); Anglo-Scottish Construction Co., Ltd., builders.

Machynlleth.—Cottage hospital (£30,000), with electrical work; C. F. Ellis, architect, Aberdovey, Merioneth.

Maidenhead.—Schools, Cookham Road, for the Church of England managers; secretary.

Manchester.—Houses (250), Brownley Green, Wythenshawe Estate; Housing Director, Town Hall. Flats, Smedley Road (£5,000); city architect. Postal sorting office, Clarence Street, Miles Platting (£8,500), for the H.M. Office of Works, Storey's Gate, Westminster, S.W.1; G. J. Mole, H.M. Office of Works.

Marske (YORKSHIRE).—Factory for Dent & Co., Chapel Lane, Hull.

Middleton.—Primary school (400 places), Boarshaw Estate; Bernard Widdows, architect, St. Mary's Chambers, St. Mary's Gate, Derby.

Middlesbrough.—Extensions to West Lane Hospital; S. E. Burgess, borough engineer.

Middlesex.—Extensions, nurses' home, North Middlesex County Hospital (£19,260); county architect.

Minster-in-Sheppey.—Houses (534), Scrap's Gate Road, for F. Bull.

Morpeth.—Alterations to King Edward Grammar School; J. Dodds, builder, Wansbeck Terrace, Morpeth.

Northampton.—Houses (160), Headlands Estate; T. Wilson & Son, Ltd.

Oxford.—Houses (598), Florence Park Estate; N. Moss & Son, Ltd. Science centre, and extensions to Temple Cowley & East Oxford schools, for E.C.; director of education.

Plymouth.—Conversion of prison into fire station and police headquarters (£28,800); J. W. Spencer.

Repton.—Council chamber, &c., Rolleston Road, Burton-on-Trent; R. S. Litherland, R.D.C. architect, 10, High Street, Burton-on-Trent.

Rochester.—School, Temple Farm Estate, Strood, for City E.C.; director of education.

Sheerness.—Public library and reading room; U.D.C. surveyor.

Shipley.—Works extension, Thackley Old Road; J. Smith, Ltd.

Slough.—Houses (44), Stoke Poges Lane, for H. Street & Co. Re-erection of factory Mill Street, for Starch Products, Ltd. Public offices (£40,000); U.D.C. surveyor.

Spennymoor.—Alterations and additions to Alderman Wraith Secondary School; F. Willey, county architect, 34, Old Elvet, Durham.

Stockport.—Houses (130), Priestnall Estate, Mouldeth Road, Heaton Mersey; Moston Brick & Building Co., Ltd., Kenyon Lane, Moston, Manchester.

Sunderland.—Houses (50), for tuberculosis families; T. P. Collinge, borough engineer.

Sutton Coldfield.—Houses (50), Chester Road and Bakers Lane; T. A. Glynn, builders, Fair View Avenue, Hampstead, Birmingham.

Twickenham.—Flats (95) and garages, Richmond Road depôt; F. R. Day. Flats (71), Poulett Lodge Estate; Sir Aston Webb & Son, architects, 19, Queen Anne's Gate, S.W.1.

Tunbridge Wells.—Cinema with shops, garage, &c. (£75,000), for Union Cinemas, Ltd.; R. Cromie, architect, 35, Baker Street, London, W.

Upton (YORKS).—Cinema for Upton Pictures, Ltd.; secretary.

Urmston.—Houses (97), Crofts Bank Road, Davyhulme; T. H. Mitchell, Ltd., builders, Woodlands Estate, Davyhulme.

Walsall.—Workshops for the blind (£60,000), with electrical work; Jeffries & Shipley, architects, 13, Bridge Street.

West Bromwich.—New baths and reconstruction old baths (£30,000); borough engineer.

West Deeping (PETERBOROUGH).—Wiring parish church and schools for electric lighting; rector.

West Riding.—Senior school, Goole (£30,436); Education dept., County Hall, Wakefield.

Wigan.—Houses (157), Alder Lane, Parbold; Pierpoint and Worthington, architects, 31A, King Street.

Winchester.—Houses, Burlesdon Road, Hedge End, for Hamtum Building Co.

Windsor.—Houses (24), Woodland Avenue, for W. Varney.

Witney.—Houses (46), Oxford Road and Cannon Pool; Groves & Sons, contractors.

Woodford (ESSEX).—Cinema for Mrs. March, Loughton Cinema; Howis & Belcham, architects, Fenchurch Street, London.